PESTICIDES ABSTRACTS

December 1975 - Vol. 8, No. 12

Abstracts 75-2906-3191

PSTAB 08(12) 793-859 (1975)

U.S. ENVIRONMENTAL PROTECTION AGENCY

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS
TECHNICAL SERVICES DIVISION
Rm. EB-49, 401 M Street, S.W.
Washington, D.C. 20460

PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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75-2906. Lang, H. P.; Glatzl, G. (OeBF-Waldbauhof, Wieselburg, Austria). und in der Waldpflege. [**Alternatives for herbicides in forestry.**] *Allg. Forstz.* 85(8): 206-209; 1974. (9 references) (German)

Problems of the use of herbicides such as 2,4,5-T, dalapon, and other growth inhibitors in forestry and alternatives for chemical weed control are discussed. Compared with mechanical weed control, chemical weed control in forestry involves substantially reduced labor costs, and has more lasting effect. Nevertheless, herbicides should be applied carefully, and persons to be entrusted with such operations should be fully aware of the potential hazards of herbicides. Herbicides should not be used in forests near urban agglomerations and in recreational areas.

75-2907. De Wilde, J. (Dep. Entomol., Agric. Univ., Wageningen, The Netherlands). **Insect population management and integrated pest control.** *Ambio* 4(3): 105-111; 1975. (14 references)

The aim of plant protection is to prevent economic damage to agricultural crops by environmental factors. Pest control is part of the plant protection field. Pesticides are a minor element in the overall pollution of the earth's biosphere. But with the increasing population and its increasing demand for food, pesticide use will likely increase greatly. The reasons for trying to attack the pest problems by a non-contaminating, predominantly biological approach are threefold. First, specific pesticides in certain regions may present a variety of problems such as disturbing the agro-ecosystem by killing natural enemies; accumulating in the soil, water, and food chains; endangering safety of the grower and consumer by residues in food products; and developing resistant strains of pests. Second, the awareness of these risks has caused the passage of tightened legislation thereby greatly increasing costs involved in pesticide registration and reducing the market life-span of insecticides. Third, by applying biological control agents, use is made of interspecific relations which in time have developed as dynamic, self-maintaining mortality factors able to regulate pest numbers and not be subject to resistance. Systems of integrated control and pest management have been developed to make use of various combinations of pest control practices.

75-2908. Jukes, T. H. (Div. Medical Physics, Univ. California, Berkeley, CA). **Cancer research.** *Chem. Eng. News* 53(40): 5; 1975.

In a letter-to-the-editor reference is made to an earlier statement by an unidentified scientist to the effect that it was necessary to remove DDT from general use now rather than wait for thirty years until people start dying of DDT-caused cancer. The letter takes exception to this statement with the following facts. People have indeed been exposed to high levels of DDT for 30 years. Workers who have been employed in the formulation of DDT since 1945 or earlier have remained well, despite the fact that they absorbed doses which for some were equivalent to 35 mg/man/day taken by mouth in solution. This point is stressed as important for the general public because the onset of cancer is accelerated by raising the dose level of a carcinogenic substance.

75-2909. Peakall, D. B. (Canadian Wildlife Service, Ottawa, Ontario, Canada). **PCB's and their environmental effects.** *Crit. Rev. Environ. Contr.* 5(4): 469-508; 1975. (251 references)

PCBs are produced in the United States under the trade names of Aroclor 1232, 1242, 1248, 1254, and 1260, and in Japan under the names Kanechlor-200, -300, -400, -500, and -600. PCBs are transported in the environment in several ways including dumping, vaporization, and leakage. Residue levels in various species in Europe, North America, the Caribbean, Japan, and the southern hemisphere are discussed; substrates include plankton; fish; sea birds such as herring gulls and brown pelican; marine mammals such as the ringed seal, harp seal, hooded seal, grey seal, bearded seal, harbor seal, bottle-nosed dolphin, common dolphin, surinam dolphin, harbor porpoise, sea lion, finback whale, and pilot whale; birds of prey; and humans and human food. The physiological effects of PCBs are considered mainly on a class-by-class basis. Acute toxicity is considered for mammals, birds, fish, and insects. Liver morphological changes have been studied extensively. A widely studied effect of organochlorine compounds is the induction of hepatic microsomal enzymes in mammals. The effects of these chemicals on mammalian reproduction are reviewed. Avian reproduction is considered in the light of eggshell thickness, egg production and hatchability, specific effects on the male of the species, and teratogenic effects. The geometric similarity of DDT and PCBs to the synthetic estrogen, stilbestrol, has led to examination of the possibility that chlorinated hydrocarbons could act as synthetic estrogens. Current evidence has not suggested that PCB exerts an important influence on thyroid function. DDT has caused an increase in liver vitamin A levels, but comparable studies with PCBs are not available. Carcinogenic studies are as yet very few. Some effects of PCBs on immunosuppressive mechanisms have been reported. Hydropericardium and generalized edema, porphyria, inhibition of adenosine triphosphatase, physiological effects on microorganisms, and the effects on non-human primates are also reviewed.

75-2910. Lowe, J. F. (Author address not given). **Disinfesting process Hertz only insects.** *Design News* 30(17): 62-63; 1975.

A 100% kill ratio of living insects, eggs, grubs, and larvae in grain was achieved by treating one hundred tons of wheat with microwave energy in a disinfestation test. The ability of the grain to germinate was not affected. Baking tests demonstrated that the taste of the final product was not distinguishable from breads made from wheat not treated in this manner. The process also prevents mold

growth, is more economical than other methods presently used, and leaves no chemical or radioactive residue. The microwave disinfesting process calls for electrical heating on non-conducting substances in a high-frequency alternating field between a pair of capacitor plates. Energy conversion, and thus heating, takes place simultaneously at all points within the material being treated and is almost instantaneous. The grain is heated to 63°C (145°F) within 1 min followed by rapid cooling to 45° (113°F). Transfer losses and temperature gradients are reduced to a minimum. The lethal effect of microwave energy exposure is attributed to a kind of thermal shock. It is suggested the process will be useful for treating bulk flour, oats, corn, and packaged products as well as wheat.

75-2911. Simpson, H. W. (Dep. Pathol., Glasgow Univ., Glasgow, Scotland). **Chronobiology: A new field of cooperation between the biologist and time series analyst.** *Biometrics* 30(3): 566; 1974.

Circadian rhythms characterize a large number of living processes and may be endogenous in many instances. This finding supports the idea that all living material, plant or animal, has a genetically predetermined structure in time, that is, a typical life "cycle" subdivided by characteristic cycles, annual, monthly, or daily, as well as cycles of high frequency, such as 1/sec in the beat of the heart, or 9/sec in the voltage changes in the brain. The field of chronobiology is significant in the area of pesticide research and usage for the farmer who wishes to kill the most insects on his crops with a given insecticide.

75-2912. Desi, I.; Erdos, G. (Natl. Inst. Public Health, Dep. Toxicol., Budapest, Hungary). **A peszticidek es a bioszfera.** [**Pesticides and the biosphere.**] *Egeszsegtudomany* 27(2): 181-191; 1973. (57 references) (Hungarian)

Literature is reviewed encompassing the transmission of pesticide contamination to soil, water, and air; pesticidal effects in useful species (game, fish, birds, etc.); and effects on man and his relationship to his environment. Modes for early detection of minor pesticide-induced impairments are presented. Conclusions are drawn from experimental evidence which suggest means of averting the risk of biospheric contamination.

75-2913. Burov, V. N. (All-Union Inst. Plant Protection, Leningrad, USSR). **Sovremennoe sostoyanie v oblasti izucheniya yuvenoidov i putey ikh prakticheskogo ispol'zovaniya v zashchite rasteniy.** [**Juvenile hormonelike agents and ways for their practical use in plant protection.**] *Khim. Sel. Khoz.* 12(9): 590-594; 1974. (18 references) (Russian)

Latest achievements in the study of natural and synthetic juvenile hormones and of their practical use as insecticidal plant protecting agents are reviewed. Aliphatic sesquiterpenes, alicyclic and aromatic sesquiterpene derivatives, alicyclic terpenes with a hetero-atom in the chain, aromatic terpenoid esters, thioethers and amines, peptide analogs of juvenile hormones, sesamex type compounds, ether of the type of dodecylmethyl ether, acyclic terpenes with two conjugated double bonds, chrysanthemummonocarboxylic acid esters, juvabione analogs, and juvenile hormone derivatives like to Cecropia moth juvenile hormone are the main known juvenile hormones. Juvenile hormone preparations are highly active and selective, but are rather labile and have short-term activity. They are hygienically and environmentally much more favorable than conventional pesticides. The mammalian LD50 values of certain juvenile hormones range from 5,000 to 15,000 mg/kg.

75-2914. Okui, H.; Imai, S. (Water Qual. Contr. Div., Environ. Agency, Tokyo, Japan). [**Environmental standard, waste water emission standard, and temporary removal standard for PCB in sediments.**] *Kogyo Yosui (Ind. Water)* 201: 11; 1975. (Japanese)

PCB pollution and its environmental standards are discussed. PCB is a totally manmade pollutant and pollution in natural environments is concentrated in living organisms because of the stable character of PCB compounds. The average human PCB intake through foods is estimated at 40.27 to 72.38 μg/day, of which 90.4% is due to consumption of fish and shellfish. The PCB safety level in fish or shellfish consumed by humans is estimated at less than 180 μg/day. Based on this figure, in August 1972 the PCB Special Committee recommended a PCB standard for fish and shellfish of 3 ppm for those caught in inland seas and bays and 0.5 ppm for those caught in nearby oceans and in deep sea. The PCB concentration ratio, defined as the ratio of PCB concentration in fish to that in ambient water, was calculated at 5667 to 8582 from experimental results obtained on eels living in water containing 1 to 5 ppb PCB. This ratio could become even higher when the actual PCB level in water was considered, and the committee selected a ratio value of 10,000. With a PCB standard for fish of 3 ppm, the PCB standard in water would be 0.0003 ppm; however, the quantitative limit imposed by the PCB analytical method specified by the Science and Technology Agency is 0.0005 ppm. Therefore it was recommended by the committee that no PCBs should be detectable in water by the current method. The wastewater emission standard for PCB was set at 0.003 ppm since the wastewater was assumed to be diluted more than 10 fold in volume when discharged into a water drainage system. The PCB standard for sedimented mud was set at 10 ppm.

75-2915. Michajlow, W. (Dep. Parasitol., Polish Academy of Sciences, Warsaw, Poland). **Parazytologia wobec problemow srodowiska zycia czlowieka wspelczesmege.** [**Parasitology and problems of the living environment of contemporary man.**] *Kosmos (Warsaw) Ser. A* 22(5): 485-494; 1973. (9 references) (Polish)

Some areas of environmental sciences whose de-

velopment will require the participation of parasitologists are discussed. The general problem is the effect of parasites on food supply. This problem has become acute in view of the population explosion in underdeveloped countries and the industrial explosion in developed countries. A majority of the earth's surface (forests, cultivated land, rivers, lakes, and seas) has an environment which is intensively destroyed and transformed by human activities which affect parasitic fauna in various ways. Some specific parasitological problems are related to the use of industrial and communal wastes in agriculture, effects of pesticides on parasites and development of a rational use of these chemicals (including their "unintentional" side effects on parasites) and effects of chemical and thermal water pollution on changes in relationships between the host and the parasite in marine fauna. Parasitological problems of urban areas deserve special consideration. In view of these potential contributions, the author presented a proposal to the Coordinating Council of the UNESCO "Man and Biosphere" program, effecting active participation of Polish parasitologists in 5 of the 13 projects supervised by that council.

75-2916. Kovacs, M.; Nadasy, M. (Res. Inst. Heavy Chem. Ind., Veszprem, Hungary). **Nocenyvedoszerek kutatasanak fejlesztese es problematikaja a Nehez egyipari Kutato Intezetben. [Pesticide research at the Research Institute for Heavy Chemical Industries.]** *Magy. Kem. Lapja* 29(8): 414-419; 1974. (33 references) (Hungarian)

A summary is presented of pesticide research performed during the past 15 years at the Research Institute for Heavy Chemical Industries, Veszprem, Hungary. The returns on funds allocated for research average about tenfold. Hungarian chemical industries employing technologies developed at the Institute manufactured products valued at about 4.4 billion Forints. These included 18,000 tons of aminochlorotriazine, 1700 tons of mercaptotriazines, 4500 tons of aktion, 12000 tons of Dikonirt-D, 1000 tons of Nitrikol, 600 tons of Nikecid, 1100 tons of Dunakoll, 30 tons of Ipam 20, 210 tons of Satox 20 WSC, and 3000 tons of Setecid 65 WP. The pesticide research capacity of the Institute is currently undergoing rapid development. Central biological, toxicological, and analytical testing facilities for the Hungarian pesticide industry will be established in the Institute, and will be charged with gathering the data required for granting approval of pesticides. Research capacities for new ingredients will also be further developed.

75-2917. Goth, G. (Agrochem. Zentrum, Friedland, DDR). **Erfahrungen in der Zusammenarbeit zwischen agrochemischen Zentren, kooperativen Abteilungen Pflanzenproduktion und Staatlichem Pflanzenschutzdienst bei der Durchfuehrung chemischer Pflanzenschutzmassnahmen unter besonderer Beruecksichtigung der Aufgaben des Umweltschutzes. [Experience regarding the cooperation between agrochemical centers, inter-farm cooperative crop production divisions and the national plant protection service in implementing measures on chemical plant protection with special consideration of environmental protection.]** *Nachrichtenbl. Pflanzenschutzdienst DDR* 29(6): 124-125; 1975. (German)

The organization of plant protection measures in the territory of the Friedland Agrochemical Center, East Germany, is presented. As the problems of plant protection cannot be solved by the national plant protection service and the agrochemical centers alone, workers responsible for plant protection were assigned to the crop production enterprises served by the Friedland agrochemical center. These workers are responsible for planning and scheduling of the plant protection measures to be taken, for supervision of plant protection, and for the maintenance of contact with the agrochemical center. The pesticides are now stored in a central, lockable storeroom. Left-overs are stored for reuse or are disposed of safely together with contaminated water generated during the cleaning of pesticide applying equipment.

75-2918. Chaudhuri, H.; Janaki Ram, K. (Central Inland Fisheries Res. Substation, Cuttack, Orissa, India). **Control of aquatic weed by moth larvae.** *Nature (London)* 253(5486): 40-41; 1975. (14 references)

The larvae of the moth, *Erastroides curvifascia* Hampson, feed specifically on foliar and stem portions of *P. stratiotes*, and their use as a potential biological control agent for the weed in fishery waters was explored. Field observations were made in a perennial pond with a dense infestation of *Pistia*. Three sets of preliminary trials were conducted in plastic pools, under simulated field conditions. The larvae introduced initially in the experimental settlings pupated after a brief period of feeding, resulting in the emergence of moths which immediately bred. The new early instar larvae caused most of the damage to the plants. These studies suggest the possibility of using the larvae of *E. curvifascia* for controlling *Pistia*, as they largely satisfy the basic requirements of a potential control agent.

75-2919. Hawksworth, D. L. (Commonwealth Mycological Inst., Kew, Surrey, England). **Man's impact on the British flora and fauna.** *Outlook Agric.* 8(1): 23-28; 1974. (56 references)

An examination was made of changes in flora and fauna occurring in Britain over the past several years. From papers presented at the symposium held on this subject it was evident that man's activities have led to the extinction of very few species of plants and animals native to the British Isles over the last 2 centuries. Fertilizers and crop protection chemicals have exhibited a variety of effects. Fertilizers of various types can encourage different larger fungi to produce their fruit bodies, but excessive applications in some cases may lead to eutrophication of surface waters into which they are washed, with repercussions on the freshwater flora and fauna. Herbicides as MCPA and 2,4-D have marked effects on cornfield weeds,

discouraging growth of some and encouraging growth of others. Organochlorine insecticides such as DDT and dieldrin, concentrating in predatory birds and causing reductions in eggshell thickness, are of grave concern. However, since the use of such compounds has been curbed, the situation in birds is now returning to normal. Agricultural chemicals usually seem to have a short-term effect on soil microfungi.

75-2920. Stryckers, J. (Lab. Herbol., Fac. Landbouwwetensch., Rijksuniv. Gent, Ghent, Belgium). **Hangende problemen inzake chemische onkruidbestrijding. [Pending problems of chemical weed control.]** *Parasitica* 30(3): 100-111; 1974. (Dutch)

Current problems of herbicide use and indications for different herbicides in different cultures are discussed. Herbicides with high toxicity should be replaced by less toxic preparations, e.g., dinitrophenol compounds by other contact herbicides, endothal sodium salt by amino salts, and paraquat by other preparations for which adequate antidotes are available. Herbicides which are persistent in water (diuron), plants (dicamba and 2,3,6-TBA), and in the soil should also be replaced by preparations with lower persistence. Also, herbicides with higher selectivity should be developed.

75-2921. Anonymous. **Chlordane—the big challenge.** *Pest Contr.* 43(8): 11-12; 1975.

A landmark test case was established on July 30, 1975 when the EPA issued a notice of intent to suspend manufacture of chlordane and heptachlor for most household and agricultural uses. These chemicals caused significant numbers of cancers in experimental animals. This finding was extrapolated as a good indication that these same chemicals would be carcinogenic to man. The cancellation process was initiated in such a manner as to speed up removal of the chemicals from public use. It is suggested that safer, more sparing use of these chemicals might have resulted had the ban been placed on homeowners using the pesticides and had they been made available only to licensed pesticide applicators. Velsicol, a manufacturer of these chemicals, has requested that new data they have presented be analyzed by an objective Scientific Advisory Committee such as the National Academy of Science. Pest control alternatives to chlordane and heptachlor do exist, but they are as yet not effective. The good record of achievements these chemicals have had, the questionable manner in which the notice of suspension was issued, the damaging coverage by the press, the need for the chemicals in agriculture and other areas of pest control, and the lack of a review by the National Academy of Science, combined with the suspension order, will make this a truly significant test of EPA's handling of cancellation and suspension.

75-2922. Anonymous. **Environmental mutagenic hazards.** *Science* 187(4176): 503-514; 1975. (36 references)

Ways are described in which environmental mutagens may be detected; possible methods of estimating the resulting adverse effects on human health and regulatory principles bearing on the prevention of environmental mutagenesis are discussed. A wide variety of new chemical compounds now have the ability to enter the environment. There is already ample evidence that at least some of these chemicals are clearly mutagenic in nature to lower organisms, and there are sound biological reasons to suspect that some of them are also mutagenic to man. Several test systems exist which can detect chemical mutagenesis reliably and sensitively. Although no system is as yet ideal, the collective use of the available systems provides important information about the potential mutagenicity of many of the chemical compounds currently present in the environment. At least preliminary estimates of the health hazards posed by environmental mutagens can be made when data from the best screening systems is combined with information about the distribution of compounds in the environment and their metabolic effects in the body. It is reasonable therefore to begin to regulate the distribution of chemical compounds. Generally, no mutagenic compound should be distributed unless it serves a truly useful purpose and there is no substitute available. Specific limits for the environmental distribution of mutagenic agents are proposed such that the resulting genetic damage not exceed a 12.5% increase over the spontaneous mutational background.

75-2923. Shtenberg, A. I.; Torchinskiy, A. M. (Inst. Nutrition, Acad. Med. Sci. USSR, Moscow, USSR). **Rtut' i vneshnyaya sreda (problemy gigieny pitaniya). [Mercury and the environment (problems of nutritional hygiene).]** *Vestn. Akad. Med. Nauk SSR* 3: 64-69; 1975. (98 references) (Russian)

The basic environmental and food hygienic problems of environmental contamination with mercury are discussed. Mercury introduced into the soil in fungicidal preparations presents no hazard environmentally or in food hygiene compared with input from industrial and other sources, as the quantity of mercury thus introduced is negligible relative to the background level. Organomercurial fungicides present acute poisoning hazards, however, and mercury accumulating through the trophic chain of dressed seeds to birds to man may be hazardous for humans. Alkyl derivatives are increasingly replaced by aryl and alkoxyalkyl organomercurial seed dressing agents due to their higher degradability. Certain plants, such as soybeans, are able to decompose organomercurials. At present, methylmercury accumulating in fish from industrial effluents represents the major hazard concerning food hygiene.

75-2924. Gysin, H. (Office Environ. Protect., CIBA-Geigy Corp., Basel, Switzerland). **International challenges in weed science.** *Weed Sci.* 22(5): 523-527; 1974.

The development is reviewed of chemicals for use in

agriculture to help farmers meet demands made by the increasing world population. The knowledge of biological activity and chemical structure relationships was poor at the beginning of herbicide research. Twenty years after the initial work on triazine herbicides was done, a much more precise idea about how the triazines have to be structured chemically in order to be biologically active has been achieved. After considerable research, it became clear that the class containing one chlorine atom and two aliphatic amino groups embraced the most valuable compounds: the atrazine (AAtrex) class. Because of significant differences in activity in a number of crops and weeds, more than a dozen triazines were developed to the marketing stage. After the development of these chemicals, field specialists have to evaluate whether some of them can be used under practical conditions and thus decide which ones to develop further. Toxicologists and biochemists study the effects of the chemicals in animals, plants, and soils. Analytical chemists develop methods to measure eventual residues in food crops. Chemical engineers work out procedures for the technical production of the selected compounds. The users of the product must be educated. In spite of the combined efforts of universities, federal and state personnel, and industry, it still took years before the preemergence herbicide treatments became a standard practice. Some metabolic pathways of these chemicals are discussed. The triazines form a typical case in which the growing practical interest in a group of chemicals stimulated many basic studies.

75-2925. Johannes, H. (Ostpreussenstrasse 9, Bergen-Enkheim, DDR). **Kontrollierter Pflanzenwuchs an und in Gewaessern. [Plant management in aquatic systems.]** *Z. Pflanzenkr. Pflanzensch.* 82(5): 286-302; 1975. (55 references) (German)

An explanation and discussion is presented on the problem of controlled plant communities near waters. The necessity for this control is revealed through consideration of plant growth near natural and artificial waters. Herbicide use is emphasized and herbicidal influence on toxicity, degradation, residues, and side effects is discussed. Conclusions drawn suggest that a model to help minimize this influence on the ecosystem should be developed after careful study.

75-2926. Miyabe, M.; Tsuchiya, H. (Nagoya Municipal Inst. Hyg., Nagoya, Aichi, Japan). [**The acute state of organochlorine insecticide residues in foods of animal origin and in human milk.**] *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 22(10 Suppl.): 223; 1975. (Japanese)

Results are presented on determinations of organochlorine insecticide residues in cow's milk, butter, cheese, cream, and powdered milk collected from commercial outlets and in human milk collected from lactating mothers in Nagoya City from Dec. 1969 to May 1975. Residual BHC was reduced remarkably in commercial milk as well as in beef, which had been highly polluted by BHC. However, the combined amount of total DDT and total BHC in human milk was still very high even in the 1975 results, suggesting extremely slow excretion from adipose tissue. The attenuation curve obtained by determining the biological half-life of BHC in human milk was thought to be longer than 1.52 yr, calculated when the pollution was more severe. With the assumption that all BHC was excreted via the cow's milk showing no inconsistency with the acute data, the attenuation curve of BHC in cow's milk suggests that the pollution of human milk would continue for a long period.

75-2927. Kigawa, H.; Kawamura, T. (Yokohama Municipal Inst. Hyg., Yokohama, Kanagawa, Japan). [**Results of deteminations of pesticide residues on agricultural crops.**] *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 22(10 Suppl.): 224; 1975. (Japanese)

Investigations of the chronological variations of pesticide residues in/on agricultural crops and the translocation of pesticide residues to crops, 1968 to the present, are presented. Agricultural crops were collected from areas of known history. The translocation of BHC, DDT, aldrin, dieldrin, and endrin was experimentally studied by growing crop plants in fields where known amounts of the pesticides were applied. Before the ban on these pesticides, residues were a little less than 100 ppb; however, after the ban, residues quickly declined to below detection limits. Exceptions were: β-BHC and the α, γ, and δ-isomers, *p,p'*-DDT, and *p,p'*-DDE. Only one case each of diazinon, ethylthiomethon and 2 cases of fenitrothion were more than 10 ppb. These residues were far less than the allowable standard. β-BHC showed the highest translocation, followed by other isomers. These findings suggest that pesticide residues found now came from the residues in soil in which endrin, DDT, BHC and DDT still remained.

75-2928. Kowase, T.; Yamazaki, K.; Mimura, S. (Tokyo Metropolitan Inst. Hyg., Tokyo, Japan). [**Organochlorine compounds in water and sediment of the Tama River.**] *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 22(10 Suppl.): 440; 1975. (Japanese)

Levels of PCB and organochlorine pesticide residues were recently determined in river water and sediment at 12 points along the Tama river, which flows through metropolitan Tokyo. PCB and organochlorines were detected at points in the lower reaches of the river, were present in traces at points in the middle reaches, and were not detected at points in the upper reaches. The concentration of β-BHC in water, when it was detected, was 0.002-0.001 ppb, and in sediment it was 0.002-0.001 ppb. The concentration of *p,p'*-DDE in sediment was determined as 0.08-0.02 ppm, and that in water was 0.03-0.01 ppb.

75-2929. Okubo, R.; Tabata, K. (Natl. For. Exp. Stn., Minist. Agric. For., Tokyo, Japan). [**Ground-level residues of fenitrothion applied by helicopter.**] *Nippon Rin Gakkai-Shi (J. Jpn. For. Soc.)* 86: 368-369; 1975. (Japanese)

Fenitrothion residue on soil, water, and low-growing plants after application by helicopter was investigated in May and June 1974. The original average amount of applied fenitrothion was 7.06 μg/10cm^2. After 7 days and a second application, the soil residue was 0.001-0.005 ppm. Just after aerial application the residue in sea mud was 0.011 ppm; however, it was reduced below the detection limit one day after the application. Residues on decayed materials ranged from 18 to 1.67 ppm and declined to 0.006-0.042 ppm after 4 mo. The deposits on low-growing plants ranged from 5.08 to 0.10 ppm and declined to 0.001-0.003 ppm after 2 mo. The amount of fenitrothion in a river flowing through the treated area was 0.17 ppm; after 24 hr, it declined to less than the detection limits. These findings suggest that fenitrothion residues from yearly applications would cause neither direct nor indirect environmental pollution.

75-2930. Matsunaga, K.; Sueishi, T.; Imanaka, M.; Ogino, Y.; Morita, K.; Ishida, T.; Itano, T.; Kawahara, G.; Ueno, S. (Hyg. Lab. Okayama Prefecture, Okayama, Japan). [**Hygienic studies on pesticide residues. Part 2. Food pollution by organochlorine pesticides.**] *Okayama-Ken Eisei Kenkyusho Nenpo (Annu. Rep. Hyg. Lab. Okayama Prefect.)* 22: 30-34; 1975. (18 references) (Japanese)

Before and after the ban on organochlorines, organochlorine pesticide residues were determined in milk, butter, conditioned dry milk, cheese, beef, pork, chicken, eggs, agricultural products, seafoods, freshwater fish, and human blood. The effect of the banning of organochlorine pesticides was clearly reflected in the reduction of such pesticide residues to less than one tenth of the rates detected in the years of most abundant application. Ocean pollution by DDT should be checked since the DDT reduction rate in chicken and eggs was less than that for BHC, and more DDT than BHC was contained in seafoods. The condensation of β-BHC was noticeable, 76% of total BHC, and reflected the pattern of pollution of foods by organochlorine pesticide residues.

75-2931. Matsunaga, K.; Ogino, Y.; Morita, K.; Sueishi, T.; Imanaka, M.; Mukada, K.; Namba, S.; Tada, Y.;

Takata, M. (Hyg. Lab. Okayama Prefecture, Okayama, Japan). [**Hygienic studies on pesticide residues. Part 3. Organochlorine pesticide residues in human milk.**] *Okayama-Ken Eisei Kenkyusho Nenpo (Annu. Rep. Hyg. Lab. Okayama Prefect.)* 22: 35-38; 1975. (6 references) (Japanese)

Human milk collected from mothers 1-3 mo after delivery in 1971-75 was examined for α-, β-, γ-, δ-isomers of BHC; *p,p'*-DDE; *p,p'*-DDD; *p,p'*-DDT; and dieldrin and aldrin. The mothers' diets were also examined for BHC, DDT and dieldrin. The BHC, DDT and dieldrin content showed a tendency to decline from the peak (0.172 ppm total DDT, 0.385 ppm total BHC, and 0.006 ppm dieldrin). However, it was observed that these values were larger than those in foods, especially the DDT values. In 1971, 1972, and 1973, the content was significantly higher in milk of rural wives than that of urban wives. The difference in BHC, DDT and dieldrin values disappeared in 1974. A tendency towards larger residue contents in younger mothers' milk was found.

75-2932. Kanitz, S.; Orlando, P. (Inst. Hyg., Univ. Genoa, Genoa, Italy). **Effetti delle radiaziioni ionizzanti sulla decomposizione dei residui di pesticidi clorurati negli alimenti. Nota II. Risultati sperimentali di prove in succhi di frutta.** [**Effects of ionizing radiation on the decomposition of organochlorine pesticide residues in food. Part 2. Experimental results of tests on fruit juice.**] *G. Ig. Med. Prev.* 13(3-4): 101-108; 1972. (9 references) (Italian)

The decomposition of aldrin added to orange juice in a concentration of 70 pg/ml by ionizing radiation (^{60}Co) at doses between 25 and 200 Krad was studied. Decomposition of aldrin at all radiation doses was observed. The rates of degradation measured after irradiation with doses of 25, 50, 100, and 200 Krad were 69%, 73.8%, 80.8%, and 83.9%, respectively. A previous experiment with 14.2 pg/ml aldrin in water revealed degradation rates of 73.2% after irradiation with 25 Krad, 95.1% after irradiation with 100 Krad, and 99% after irradiation with 200 Krad.

75-2933. Tagatz, M. E.; Borthwick, P. W.; Cook, G. H.; Coppage, D. L. (U.S. EPA, Gulf Breeze Environ. Res. Lab., Sabine Island, Gulf Breeze, FL 32561). **Effects of ground applications of malathion on salt-marsh environments in northwestern Florida.** *Mosquito News* 34(3): 309-315; 1974. (10 references)

Thermal fog applications (6 wt. oz/acre, 420 g/ha) and ULV aerosol spray applications (0.64 fl. oz/acre, 57 g/ha) of malathion 95 were made on salt-marsh environments near Pensacola Beach, Florida. The effects of these applications on the environment were investigated. After each of 3 treatments using a portable thermal fogger and three ultra low volume sprays with a truck-mounted generator, studies were carried out on selected areas. The conditions employed were similar to those encountered in actual mosquito fogging operations. Deaths due to malathion were not noted among confined blue crabs, *Callinectes sapidus*; grass shrimps, *Palaemonetes vulgaris* and *P. pugio*; pink shrimp, *Penaeus duorarum*; or sheepshead minnows, *Cyprinodon variegatus*. No reduction in brain acetylcholinesterase activity was noted in confined *C. variegatus* exposed to one or more of the treatments. No measurable malathion was found in confined animals or the snail, *Littorina irrorata*. The chemical was not detected in sediment. However, in *Juncus sp.*, concentrations as high as 4.10 ppm were found, with trace amounts persisting as long as 14 days. The highest concentration after fogging on marsh waters was 5.2 ppb; after ULV spraying, 0.49 ppb. Only trace amounts persisted in marsh water as long as 1 day after either method of application.

75-2934. Ohkawa, H.; Mikami, N.; Miyamoto, J. (Sumitomo Chem. Co. Ltd., Takarazuka, Hyogo, Japan). **Photodecomposition of Sumithion** [***O,O*-dimethyl-*O*-(3-methyl-4-nitrophenyl)-phosphorothioate**] *Agric. Biol. Chem. (Tokyo)* 38(11): 2247-2255; 1974. (16 references)

When Sumithion (fenitrothion) solutions in various solvents in air or deposits on silica gel chromatoplates were irradiated with UV light or sunlight, the following products were obtained: carboxysumithion, sumioxon, carboxysumioxon, 3-methyl-4-nitrophenol, 3-carboxy-4-nitrophenol, and methyl parathion (solutions). A trace amount of sumithion *S*-isomer was found in aqueous methanol solution irradiated with UV light in nitrogen and water solution exposed to sunlight. The same photoproducts in almost the same proportions were formed on both chromatoplates and leaf surfaces of bean plants. Two major products, carboxysumithion and sumioxon, and 3-methyl-4-nitrophenol were further degraded into more polar products, and finally into polymeric humic acids. Certain carbamate and pyrethroid insecticides slightly accelerated the photodecomposition of Sumithion. (Author abstract by permission)

75-2935. Maksymov, J. K. (Swiss Inst. Forestry Res., Birmensdorf/Zurich, Switzerland). **Persistenz von Lindan an jungen Laerchen.** [**Persistence of lindane on young larch trees.**] *Anz. Schaedlingskd. Pflanzensch.* 47(8): 113-115; 1974. (10 references) (German)

Twigs and needles of young larch trees were analyzed gas-chromatographically with a chlorine-specific microcoulometric detector for lindane residues 351 and 570 days after spraying with 0.03% lindane for larch thrips, *T. laricivorus*. A lindane residue of 0.02 ppm was found in young needles from one of the 8 trees sprayed 351 days earlier, which indicates translocation of lindane in plant tissues. The lindane residues found in twigs sampled after 351 days were in the range of 0.03-0.14 ppm, and those found in more intensely treated twigs after 570 days were between 0.15 and 0.62 ppm. The findings indicate persistence of lindane, which consequently should not be used in plant production for human consumption.

75-2936. Sell, J. L.; Deitz, F. D.; Buchanan, M. L. (Anim. Sci. Dep., North Dakota State Univ., Fargo, ND

58102). **Concentration of mercury in animal products and soils of North Dakota.** *Arch. Environ. Contam. Toxicol.* 3(3): 278-288; 1975. (29 references)

Total mercury (Hg) was determined in milk, eggs, beef, pork, human head hair, soil and water obtained from four geographical areas of North Dakota. The sampling areas were selected on the basis of differences in prevalent agricultural practices, climate, and topography. Statewide average Hg concentrations in ppb were milk, 0.8; eggs, 12; beef muscle, 5; beef liver, 10; pork muscle, 11; pork liver, 15; head hair, 1708; soil, 30; rainwater and well water, less than one. There were no significant differences observed among areas in Hg content of any substance sampled except beef muscle. Beef muscle obtained from areas 2 and 4 contained significantly ($P \leq 0.05$) higher levels of Hg than beef muscle from the other two areas. However, the magnitudes of differences were small (4 to 6 ppb). Considerable variation among individual beef and swine were noted but only six beef of 453 samples and three swine of 156 samples had tissue Hg exceeding 50 ppb. Appreciable variation was observed in Hg in eggs with respect to farms within an area, eggs from the same farm, and sampling times within a year. Few eggs sampled contained more than 50 ppb. Significantly ($P \leq 0.01$) higher levels of Hg were found in head hair of women as compared with men and relatively large differences among individuals were observed. Average Hg in hair was generally low irrespective of sex of donor or area of the state as compared with data given in the literature. Soil Hg levels were consistently low in all areas of the state, and no relationship between cropping practices and soil Hg was detected. (Author abstract by permission)

75-2937. Burns, J. E.; Parker, R. D. (Inst. Environ. Med., New York Univ. Med. Cent., New York, NY 10016). **An investigation of the safety of cotton reentry after organophosphate application.** *Arch. Environ. Contam. Toxicol.* 3(3): 344-351; 1975. (11 references)

Twelve cotton insect scouts were monitored during an entire pesticide application season by weekly determinations of *para*-nitrophenol excretion and biweekly cholinesterase measurements. This data was compared to weekly reentry intervals and pesticide application rates to study the validity of a 48-hr minimum reentry interval for methyl parathion-treated cotton. Methyl parathion represented 54.2% of the total amount of pesticide used with toxaphene 35.3%, ethyl parathion 4.1%, and other 6.4%. A significant decrease in erythrocyte and plasma cholinesterase was observed during initial exposure but during peak exposure the cholinesterase levels had returned to normal. The maximum mean amount of methyl and ethyl parathion absorbed by calculation from PNP excretion was 0.95 mg/24hr ($n = 12$). Twelve percent of all reentries were within two days and during one week 48% occurred during the first two days after pesticide application. (Author abstract by permission)

75-2938. Hall, F. R.; Reichard, D. L.; Krueger, H. R. (Dep. Entomol., Ohio Agric. Res. Dev. Cent., Wooster, OH 44691). **Dislodgeable azinphosmethyl residues from air blast spraying of apple foliage in Ohio.** *Arch. Environ. Contam. Toxicol.* 3(3): 352-363; 1975. (15 references)

The distribution and decay rates of dislodgeable residues of azinphosmethyl applied by two types of air blast sprayers on apple foliage in Ohio were investigated. Leaf discs were taken from nine sites located on the periphery of Cortland apple trees at five dates after spraying. The sprayer delivering the higher airflow rate, but lower velocity, deposited the pesticide much more uniformly over the trees and applied more on the top of the tree. The other sprayer deposited the greatest proportion of pesticide on the site nearest the sprayer. The residue decreased at all sites and ranged from 42 to near 100% decrease at 14 days after spraying. (Author abstract by permission)

75-2939. Knapek, R. (Instytut Ochrony Roslin, Poznan, Poland). **Metodyka wyznaczania szybkesci zanikania pestycydow w materiale roslinnym. [Estimation of the dynamics of pesticide degradation in plant material.]** *Biul. Inst. Ochr. Rosl.* 54: 169-176; 1972. (5 references) (Polish)

An attempt is made to present a uniform, standard procedure for measuring the dynamics of degradation of pesticides and determining their residues in plants. The purpose is to obtain a procedure that would permit comparison of results obtained by different research institutes. The parameters discussed are localization of test lots to eliminate non-typical and uncontrolled factors; size of lots and size of test samples, which are recommended in tabular form for 13 varieties of plants and fruit; number and intervals of pesticide application; concentration of solutions and quantities to be used per unit area; use of uniform machinery. A minimum of 5 samples are required for analyzing the dynamics of degradation, and 11 samples are recommended. Samples should be distributed uniformly, without emission of inferior specimens. Storage and transport of field samples should take less than 2 days and refrigeration or freezing facilities must be available. Each field sample should yield at least 2 samples of 50-500 grams for laboratory analysis. Analysis methods should be standard and of established reliability. A minimum of 2 analyses must be performed on every field sample. Results should be presented in the form of a degradation curve on a semilogarithmic scale on which every point represents an average of at least 4 analyses and deviations are clearly indicated. A record of meteorological data should be included in the report. Measurements of residues follow the same procedure, except that pesticide is applied at the times recommended by the manufacturer and the samples are obtained at normal harvesting time. For economic reasons the various plants and trees have been divided ito 12 groups such that every group can be tested under the same conditions.

75-2940. Yoshida, H.; Kambara, Y.; Ranby, B. (Fac. Eng., Hokkaido Univ., Kita-Ku, Sapporo 060, Japan). **ESR spectra of radicals during photolysis of chloranil in**

solutions. *Bull. Chem. Soc. Jpn.* 47(10): 2599-2600; 1974. (4 references)

The electron spin resonance spectra of short-lived intermediates formed during photolysis of chloranil in 2-propanol, ethanol, methanol, and benzene were recorded at room temperature. The spectra observed from solution in the alcohols are identified as due to neutral semiquinone radicals. The ESR spectra observed during photolysis of chloranil in alcohols are due to the neutral radical regardless of the alcohol used as solvent. The ESR spectrum of only the neutral radical is observed during chloranil photolysis, while the spectra of both neutral radical and radical anion are simultaneously observed during the photolysis of benzoquinone and its methyl derivatives in the same solvents. The spectrum observed from solution of chloranil in benzene during photolysis is much wider. It is suggested that this may be due to the neutral semiquinone radical, as the addition of acetic acid caused no change in the shape and intensity of the spectrum. It is inferred from the data that the photochemical reactions involved are complex but the excited chloranil molecule abstracts a hydrogen atom from the benzene ring. In addition to the main broad spectrum, spectra composed of several sharp hyperfine lines were traced from both the benzene and toluene solutions. They were too weak to record, but are believed to be due to free radicals formed from solvent molecules.

75-2941. Dimond, J. B.; Owen, R. B., Jr.; Getchell, A. S. (Life Sci. Agric. Exp. Stn., Univ. Maine, Orono, ME 04473). **Distribution of DDTR in a uniformly-treated stream.** *Bull. Environ. Contam. Toxicol.* 12(5): 522-528; 1974. (11 references)

Webster Brook, a 9,870 acre watershed in northern Maine, was uniformly sprayed with 1 lb/acre of DDT in 1960 and in 1963 for control of the spruce budworm, *Choristoneura fumiferana*. The brook is a quick water stream, but there is a natural deadwater at its midpoint and its flow is frequently interrepted by ponding. Brook trout (*Salvelinus fontinalis*) and a crayfish (*Cambarus bartoni*) were collected at 19 points along the 10 mi length of the brook and were analyzed by gas chromatography to determine total DDT residues (DDTR). DDTR in the trout varied between 0.4 and 0.9 ppm with no apparent trends related to location along the stream and no significant differences according to age of the fish. The highest residue levels were detected in fish caught at the headwater site of the stream. The residue levels in the crayfish were 10-25% of those in the trout; the concentrations did not vary significantly with age or size, and there were no apparent trends related to location along the stream. In the trout, 60-80% of the DDTR was in the form of DDE and the remainder was equally divided between DDT and DDD. In the crayfish, DDE comprised 60% of the DDTR and DDT comprised 40%, with traces of DDD occurring in only a few specimens. The highest mud residues were in samples taken from the deadwater area and the ponding areas; the residue levels in the mud samples varied with their organic matter and fine mineral soil contents. DDD comprised 35-60% of the mud residues and DDT and DDE comprised 30% and 25%, respectively. The data suggests a constant residue concentration throughout the drainage.

75-2942. Hosler, C. F., Jr. (Dep. Chem., Univ. Wisconsin-La Crosse, La Crosse, WI 54601). **Degradation of Zectran in alkaline water.** *Bull. Environ. Contam. Toxicol.* 12(5): 599-605; 1974. (10 references)

Zectran (mexacarb) or xylenol in acetone was dissolved in a distilled water medium containing $NaHCO_3$, $CaSO_4$, $MgSO_4$, and KCl; the final Zectran or xylenol concentration was 22.5 mg/l. The solution was illuminated with fluorescent laboratory lights for 9 hr/day; the intensity of illumination at the bottom of the water bath measured 40 ft-candles. At various intervals, the aged Zectran and xylenol solutions were resolved into their various components by high pressure liquid chromatography. The half-life of Zectran at pH 9.5 was about 2 days, whereas at pH 7.4 it was about 2 weeks. Five components were separated after incubation of Zectran at pH 9.5; only two of these components persisted after several weeks, and both reached peak concentrations two or more times throughout the experiment. The order of appearance of the various components with time suggested degradation to even more polar components. The same components arose in the same order in the xylenol solutions, but the rates of appearance were greatly accelerated. At pH 7.4, only two components arose in the xylenol solutions; one of them probably was acetone. At the same pH, only the acetone component was detectable in the Zectran solutions. It appears that at pH 9-9.5, Zectran rapidly hydrolyzes to xylenol, which then converts to its xylenoxide ion form; this form is very sensitive to photooxidation.

75-2943. Achari, R. G.; Sandhu, S. S.; Warren, W. J. (Dep. Nat. Sci., South Carolina State Coll., Orangeburg, SC 29115). **Chlorinated hydrocarbon residues in ground water.** *Bull. Environ. Contam. Toxicol.* 13(1): 94-96; 1975. (6 references)

Ground water samples were obtained from various areas in Georgetown County in South Carolina. The county is largely agricultural, and substantial amounts of pesticides are used for crop protection. It borders on the Atlantic ocean and has a sandy soil. Analysis of the samples was by electron capture gas-liquid chromatography. All of the samples contained chlorinated hydrocarbon residues at the ppt level depsite the fact that the use of these pesticides has been severely restricted in the last few years. DDT was generally present in the greatest quantities, averaging 74.5% of the total residue, but lindane (average 1.19% of total residue) and aldrin (average 7.11% of total residue) were also found. In all cases the residue levels were well below the recommended federal limits for drinking water. It is possible that the accumulation of these pesticides in the ground water in the areas under investigation reflects a general pesticidal pollution across the nation

rather than a pollution caused by the local use of pesticides.

75-2944. Dorough, H. W.; Atallah, Y. H. (Dep. Entomol., Univ. Kentucky, Lexington, KY 40506). **Cigarette smoke as a source of pesticide exposure.** *Bull. Environ. Contam. Toxicol.* 13(1): 101-107; 1975. (8 references)

1R1 reference research cigarettes (85 mm) were impregnated with ^{14}C-labeled carbaryl, carbofuran, leptophos, mirex, or DDT (100 ppm in acetone). Lightly anesthetized female Sprague-Dawley rats were exposed to the smoke from these cigarettes in a smoking apparatus. Evaluation of the residues in the mainstream smoke indicated that the insecticides were degraded to different degrees by the smoking process; recovery of unaltered insecticide varied from 69% for mirex to 21% for leptophos. Pyrolytic stability was not the only factor involved in the transfer of insecticide residues to the mainstream smoke; much of the intact compound appeared to vaporize away from the intense heat at the burning point of the cigarette and transferred to the smoke. On the ^{14}C-residues inhaled, 30.5 (leptophos) to 52.2% (carbofuran) was exhaled, 31.4 (carbaryl) to 39.5% (DDT) was recovered from the lung, 11.1 (mirex) to 33.9% (leptophos) was recovered from the blood, and 1.3 (mirex) to 3.6% (carbofuran and leptophos) was recovered from the heart. The distribution and/or retention patterns did not vary with the chemical type of the compound. The data indicated that the smoke administered to rats or humans would contain the same ^{14}C-residues and at concentrations generally commensurate with lung capacity; the results were similar with pesticide concentrations of 30 and 100 ppm. Commercial filters and increasing the butt length of unfiltered cigarettes reduced the mainstream smoke residues by 36-49% and 29%, respectively.

75-2945. Dimond, J. B.; Owen, R. B., Jr.; Getchell, A. S. (Life Sci. Agric. Exp. Stn., Univ. Maine, Orono, ME 04473). **DDT residues in forest biota: further data.** *Bull. Environ. Contam. Toxicol.* 13(1): 117-122; 1975. (12 references)

Toads (*Bufo americana*), snakes (eastern garter, *Thamnophis sirtalis*), frogs (*Rana clamitans, R. pipiens, R. palustris,* and *R. catesbiana*), and ravens (*Corvus corax*) were collected between 1966 and 1969 from Maine forests which had been sprayed with DDT at a rate of 1 lb/acre in 1958, 1960, 1961, 1963, 1964, and 1967. The specimens were analyzed by gas chromatography. The residue levels in the frogs were relatively low; they were somewhat higher in the tadpoles, toads, and snakes. All taxa showed cumulative levels in the retreated areas. Residue levels in a year of treatment would be about 1 ppm in the tadpoles and 2-3 ppm in the other animals. The residue levels in the ravens showed no relation to the DDT treatment history of the collection sites. The levels were high, reaching up to 21.55 ppm in a bird taken in 1963. Frogs, toads, and snakes do not appear threatened by single or infrequent moderate applications of DDT, but ravens will accumulate high residue levels under conditions of moderate forest use, discontinued agricultural use, and use in rural villages.

75-2946. Wright, C. G.; Jackson, M. D. (Dep. Entomol., North Carolina State Univ., Raleigh, NC 27607). **Insecticide residues in non-target areas of rooms after two methods of crack and crevice application.** *Bull. Environ. Contam. Toxicol.* 13(1): 123-128; 1975. (3 references)

The cracks and crevices in vacant college dormitory rooms were sprayed with emulsion or aerosol-type formulations of diazinon and chlorpyrifos at the recommended and twice the recommended concentrations. Closet doors were opened, windows closed, shades drawn, and cracks around doors sealed with masking tape prior to spraying. Aluminum pie plates were positioned in the rooms as spray collectors. Residues were analyzed by flame photometric gas chromatography. The temperature and relative humidity were 23°C and 50%. The mean amount of aerosol-type spray applied per room was 21.0 g and the mean amount of emulsion applied with the compressed air sprayer was 115 ml. Only 16% and 22% as much technical diazinon and chlorpyrifos, respectively, were applied by the aerosol-type sprayer as by the compressed air sprayer, and the insecticide residues on the pie plates were always lower in the rooms treated with the aerosol-type spray. Virtually no insecticide was present on plates removed after 0.2 days with the aerosol-type spray, while compressed air sprayer residues remained throughout the test period (8 days). Residue levels were higher in the rooms treated with insecticide at twice the recommended rate and on the floors as compared with the ceilings. The data showed significantly less movement of insecticides to nontarget areas with the aerosol-type sprayer than with the compressed air sprayer.

75-2947. Staiff, D. C.; Comer, S. W.; Foster, R. J. (Field Studies Sect., Pesticides Toxic Substances Effects Lab., Wenatchee, WA 98801). **Residues of parathion and conversion products on apple and peach foliage resulting from repeated spray applications.** *Bull. Environ. Contam. Toxicol.* 14(2): 135-139; 1975. (4 references)

Five apple trees were sprayed weekly throughout an 11-week period during the summer of 1972 with a conventional 0.03% parathion solution. Similar spraying was carried out on peach trees. Residue levels in the foliage were determined by flame photometric gas chromatographic analysis of leaf punch samples. The highest residue levels on the apple foliage were found during the first and second weeks; there was no indication of buildup from week to week. At 7 days after application, the average parathion residues were 30% of the levels found on day 1 after application. The half-life of the original residue was estimated to be about 3 days. Although the paraoxon levels were comparatively small, a decay pattern similar to the parent compound was found. Within 34 days after application,

neither parathion nor paraoxon could be detected; nor was any S-ethyl isomer of parathion detected at any time. The reduction of parathion residues over the weekly periods between spray applications was even greater on the peach foliage than on the apple foliage. The average maximum daily temperature during the 11-week study period was 30°C and the average minimum temperature was 12.8°C. Rainfall was minimal.

75-2948. Spencer, W. F.; Cliath, M. M.; Davis, K. R.; Spear, R. C.; Popendorf, W. J. (Agric. Res. Serv., U.S. Dep. Agric., Riverside, CA 92502). **Persistence of parathion and its oxidation to paraoxon on the soil surface as related to worker reentry into treated crops.** *Bull. Environ. Contam. Toxicol.* 14(3): 265-272; 1975. (16 references)

Ethyl parathion (wettable powder) was sprayed on plots containing about 250 citrus trees at a rate of 2, 4, or 8 lb/acre. Fruit pickers reentered the groves 14, 21, or 25 days later. Samples of soil and loose dust were obtained periodically and analyzed for parathion and paraoxon residues by gas chromatography. The parathion concentrations in the dust were very high, and the pesticide was rapidly oxidized to paraoxon. The paraoxon concentrations remained above 100 μg/g for at least 46 days after application. Although the residue concentrations were much higher in the dust than in the dry soil samples when expressed on a weight basis, the reverse was true when the concentrations were expressed on an area basis. The ratio of paraoxon to parathion was greater in the dust than in the dry soil. Paraoxon was produced only at the soil surface, probably by photolysis. Parathion did not persist and paraoxon did not accumulate in the wet soil of the irrigation furrows. The data indicates that the soil or grove floor should be considered as a possible contributing source of toxicant along with foliage, or dust on foliage, to workers reentering treated fields.

75-2949. Ware, G. W.; Cahill, W. P.; Estesen, B. J.; Marchello, J. A. (Dep. Entomol., Univ. Arizona, Tucson, AZ 85721). **Using blood DDT residue to predict fat residue in beef animals.** *Bull. Environ. Contam. Toxicol.* 14(3): 285-288; 1975. (4 references)

In 1969, Arizona placed a moratorium on the agricultural use of DDT. Carcass fat samples from major feedlots in Arizona were analyzed for DDTR during the period November 1968-September 1970. The beef fat residues of DDTR declined in the 2 years following the moratorium on DDT. The determination of DDTR residues in whole blood was subsequently investigated as a short-cut analytical method which would reveal fat residues before slaughter. Twelve half-sibling steers were fed diets containing no added tallow, or 5-15% added tallow. The animals had previously been maintained on a sub-maintenance diet to reduce body fat stores. At slaughter, blood samples and fat samples from the left kidney knob were analyzed for DDTR. Except for the steers given the 10% added tallow, there was good correlation between the ratios of DDTR residues in the kidney fat and blood (average 790). Thus, the analysis of blood samples from living beef animals might provide an accurate estimate of carcass fat DDTR residues prior to slaughter.

75-2950. Hance, R. J. (Weed Res. Organ., Begbroke, England). **Degradation of herbicides.** *Chem. Ind. (London)* 15: 610-611; 1974.

Factors which control decomposition of herbicides in the soil are considered both from the viewpoint of weed control and from that of crop damage and pollution. Field and laboratory studies regarding these questions are discussed. In studies on simazine, one of the most persistent herbicides, results showed that under most conditions a spring or summer application of 2 lb/A left a residue of less than 10% by the autumn. Degradation appeared slower in drier areas and on soils of high pH. Other field experiments involve repeated applications of the same herbicides over a number of years. In laboratory studies organic molecules in the soil are exposed to chemical and biological processes to determine the relative importance of each process in the degradation of the chemical. Laboratory studies suggest that many compounds may be degraded in the soil, to some extent, by purely chemical means. Particularly with 1,3,5-triazines, these chemical processes could make a significant contribution to their degradation. High temperature and abundant moisture also enhance herbicide decomposition in the soil. However, in most cases it is thought that microbial activity is of prime importance. Experiments have shown that the rates of breakdown are quite independent of adsorption. Currently there is little a farmer can do to manipulate the residence time of herbicides in the soil. It is hoped that continued studies will lead to the development of techniques which will improve this situation.

75-2951. Freitag, D.; Weisgerber, I.; Klein, W.; Korte, F. (Inst. Ecol. Chem., Gesellschaft fuer Strahlen- und Umweltforschung mbH, Munich, Germany). **Beitraege zur oekologischen Chemie LXXVI. Schicksal von Hexachlorbenzol-14C in Sommerweizen und Boden nach Saatgutbehandlung.** [**Ecological chemistry. Part 76. Fate of hexachlorobenzene-14C in summer wheat and soil after seed treatment.**] *Chemosphere* 3(4): 139-142; 1974. (10 references) (German)

The translocation and metabolism of 14C-labeled hexachlorobenzene in summer wheat and soil was studied after the ripening of summer wheat grown from seeds treated with 50 g labeled hexachlorobenzene per 100 kg. A total of 72% of the initial radioactivity were recovered in wheat plants, weeds, and soil. The percentages of the recovered radioactivity were determined to be 94.8% in soil, 4.31% in wheat roots, 0.61% in straw and chaffs, 0.17% in grains, and 0.11% in weeds. The corresponding percentages of the radioactivity applied were 68.6% in the soil, 3.12% in wheat roots, 0.45% in straw and chaffs, 0.12% in grains, and 0.08% in weeds. The pesticide residues were 0.02 ppm in the soil, 2.857 ppm in wheat roots,

0.058 ppm in straw and chaffs, 0.02 ppm in grains, and 0.421 ppm in weeds. No metabolites of hexachlorobenzene were found.

75-2952. Kotzias, D.; Klein, W.; Korte, F. (Inst. Ecol. Chem., Gesellschaft fuer Strahlen- und Umweltforschung mbH, Munich, Germany). **Beitraege zur oekologischen Chemie LXXIX. Reaktionen von Buturon und Monolinuron in fester und fluessiger Phase bei UV-Bestrahlung. [Ecological chemistry. Part 79. Reactions of buturon and monolinuron in solid and liquid phase during UV irradiation.]** *Chemosphere* 3(4): 161-166; 1974. (7 references) (German)

The reactions of buturon and monolinuron in solid and liquid phase, on solid substrate, and in sterilized soil were studied during UV irradiation. Eleven reaction products, including 2 phenolic products, were found following the irradiation of buturon in methanol. No phenolic products were found after irradiation of crystalline buturon. Irradiation of monolinuron in water or methanol resulted in 9 metabolites. The monolinuron conversion rates after irradiation for 23 hr at wavelengths over 300 nm were 66% in water, 94% in methanol, and 99% in methanol in nitrogen atmosphere. The conversion rate for buturon also was highest under nitrogen. Monolinuron formed no phenolic products when irradiated as a solid. Aniline and *p*-chloroaniline were found after irradiation of buturon and monolinuron in liquid phase.

75-2953. Kirchhoff, J. (Dep. Phytopathol. Plant Protect., Hohenheim Univ., Stuttgart-Hohenheim, Germany). **Versuche zum Verhalten von Parathion-Rueckstaenden bei der Verarbeitung von Kirschen und Aepfeln. [Study of parathion residue dynamics during the processing of cherries and apples.]** *Dtsch. Lebensm.-Rundsch.* 71(2): 64-67; 1975. (13 references) (German)

Parathion residue dynamics were studied in sour cherries and apples during processing according to home preparative methods. Washing sour cherries containing 3.8 ppm parathion resulted in a 20% decrease in the residue level, while canning and jelly-making caused practically no reduction in the residue level. It was possible to remove 95% of the residue from apples containing 1.35 ppm parathion by peeling. Canning of apples caused practically no abatement, while processing to puree, juice, or jelly reduced the residue level considerably due to translocation into wastes. Neither heating nor storage of the processed foods at 13-16°C for several months caused any appreciable reduction in the parathion residue level.

75-2954. Yu, C. C.; Booth, G. M.; Hansen, D. J.; Larsen, J. R. (Dep. Entomol., New York State Agric. Exp. Stn., Geneva, NY 14456). **Fate of Bux insecticide in a model ecosystem.** *Environ. Entomol.* 3(6): 975-977; 1974. (5 references)

Carbonyl-^{14}C-labeled major Bux (metalkamate) isomer, *m*-(1-methylbutyl)-phenyl methylcarbamate, was studied for 33 days in a model ecosystem devised by R. L. Metcalf and his associates. Bux insecticide rapidly degraded in water with a half-life of less than 4 days at pH 7.9. Most of the metabolites were present as conjugates or other polar metabolites. Bux insecticide was highly toxic to the aquatic animals immediately after application of this compound to the model ecosystem. After 33 days, algae and *Elodea* plants contained ca. 0.2-1 ppm of insecticide, and living crabs contained ca. 0.02-0.08 ppm of Bux. A clam which died 10 days after application contained ca. 0.3 ppm. It is unlikely that Bux will cause long-term environmental contamination although it will produce short-term adverse effects on aquatic animals if the compound is applied to water or enters water shortly after application. (Author abstract by permission)

75-2955. La Hue, D. W.; Kirk, L. D.; Mustakas, G. C. (Grain Marketing Res. Cent., Manhattan, KS 66502). **Fate of dichlorvos residues during milling and oil extraction of soybeans.** *Environ. Entomol.* 4(1): 11-14; 1975. (5 references)

One week after stored soybeans were treated with 20 ppm dichlorvos in a water emulsion, all milling and processing fractions contained residues though less than 1 ppm was present on the whole beans. Steaming did not remove residues from the dehulled meats, crude oil, or meal. Residues from the flakes passed into the miscella (extracted oil in hexane) and extracted marc (flakes with oil removed by extraction) and were subsequently detected in the crude oil and crude meal and in the hexane from both of these fractions. The residues could be removed from the hulls and crude meal by toasting and from the crude oil by refining. (Author abstract by permission)

75-2956. Morita, M.; Ohi, G. (Tokyo Metrop. Res. Lab. Public Health, Shinjuku-Ku, Tokyo, Japan). ***Para*-dichlorobenzene in human tissue and atmosphere in Tokyo metropolitan area.** *Environ. Pollut.* 8(4): 269-274; 1975. (13 references)

Thirty-four human adipose tissue samples and 6 blood samples taken from persons in the metropolitan area of Tokyo were found to contain *para*-dichlorobenzene, an agent used as a moth repellent and a deodorant. Human fat contained roughly equal concentrations of *p*-dichlorobenzene and polychlorinated biphenyls, whereas the level of *p*-dichlorobenzene in the blood was 3 times higher than that of the PCBs. Not only did indoor air samples contain appreciable levels of *p*-dichlorobenzene, so did the ambient air in and outside the Tokyo area, suggesting that inhalation is one of the major routes of entry into the human body. The physiological implication of miniscule levels of *p*-dichlorobenzene together with other environmental pollutants is obscure.

75-2957. Epstein, J. (Defense Res. Branch, Chem. Lab., U.S. Army Edgewood Arsenal, Aberdeen Proving

Ground, MD). **Properties of GB in water.** *J. Am. Water Works Assoc.* 66(1): 31-37; 1974. (28 references)

Use of the nerve gas isopropyl methylphosphonofluoridate (GB, sarin) to contaminate the water in the reservoir of a city is discussed. The hazards of handling GB, due to its high vapor toxicity, preclude its use for sabotage in quantities sufficient to contaminate reservoirs with a capacity on the order of 100 million gal to levels necessary to cause symptoms of intoxication to the public. Contamination, though possible in a small volume of water, would still be hazardous to accomplish and unlikely to be attained. Should a water supply become contaminated, there are adequate methods, enzymatic, chemical, and biochemical, available for detecting and analyzing the GB in the water. Treatment procedures to remove or destroy the GB are available.

75-2958. Burbank, N. C., Jr. (Sch. Public Health, Univ. Hawaii, Honolulu, HI). **Mililani town wastewater reclamation and recycling project.** *J. Am. Water Works Assoc.* 67(9): 487-489; 1975. (18 references)

Analyses of water from several selected sources in Hawaii are reported. At the end of the study it was concluded that the level of carbon chloroform extract concentrations ranged from 5-7 ppb in the town to 51 ppb in rural and agricultural zones. No chlorinated pesticides were detected in any of the extracts. In previous studies Oahu drinking water was found to contain DDT and other chlorinated hydrocarbons in minute traces. The standard carbon method used in the present study was incapable of recovering those chemicals in detectable quantitites. There was some evidence of the possible presence of phenols, perhaps from the use of pentachlorphenol as a termite-proofing treatment. Rapidly increasing demands on the water supply in Hawaii have called for consideration of reclamation practices for the reuse and recycling of water from sewage by irrigation. It is necessary that the baseline information on carbon chloroform extract be collected from both raw sewage effluent and sewage effluent that has percolated through bare soil or a living filter or both. It is desirable to have further evidence of the viability and retention of virus and changes in chemical constituents in sewage as it passes through an undisturbed soil column. Appreciable quantities of chlorine will be needed to kill enteric viruses effectively. The use of an alternative material, a virucide bromin chloride, reported to have a more immediate, more complete virucidal action than chlorine at the same dosage, is considered.

75-2959. Farmer, W. J.; Spencer, W. F.; Shepherd, R. A.; Cliath, M. M. (Dep. Soil Sci. Agric. Eng., Univ. California, Riverside, CA). **Effect of flooding and organic matter applications on DDT residues in soil.** *J. Environ. Qual.* 3(4): 343-346; 1974. (12 references)

A field in Coachella Valley, California which had received repeated applications of technical DDT to sweet corn (*Zea mays* L.) for ear worm [*Heliothis zea* (Boddie)] control was flooded 48 days, with and without organic matter amendments, to determine whether DDT soil concentrations could be effectively reduced. Applications of 180 and 45 metric tons/ha of feedlot manure and 18 and 5.6 metric tons/ha of alfalfa (*Medicago sativa* L.) meal were disked to a depth of 15 cm. Redox potentials in all flooded plots rapidly dropped below -150 mV at both the 7.5 and 15 cm soil depths. All flooded plots including control plots showed a rapid accumulation of the respective DDD isomers in the top 15 cm. Flooding had little effect on the DDE isomers. By the end of the flood period *p,p'*-DDT had decreased from 8.1 μg/g to 0.5 to 1.6 μg/g in flooded plots receiving organic amendments while the *p,p'*-DDD level increased from zero to 4.2 to 5.6 μg/g. The rates of disappearance of DDT and the formation of DDD were significantly lower in the flooded plots receiving no organic amendments. After 18 days flooding the rates of *p,p'*-DDT losses and DDD gains were in the order of 180 metric tons/ha manure ≈ 18 metric tons/ha alfalfa > 5.8 metric tons/ha alfalfa ≈ 45 metric tons/ha manure > control. The transformation of DDT isomers to DDD isomers occurred to a lesser extent at 15-30, 30-45, and 45-50 cm soil depths. The data indicates that flooding organic matter-amended soil effectively reduced DDT concentrations to very low levels. The fate of DDD in flooded soils is unknown. However, through the formation of DDD, the conversion of DDT to the potentially hazardous DDE is prevented. (Author abstract by permission)

75-2960. Satpathy, J. M.; Dash, P. K.; Misra, B. (Coll. Agric, Bhubanewar, Orissa, India). **Insecticidal residues in some vegetable crops grown in treated soils.** *Indian J. Agric. Sci.* 44(2): 113-115; 1974. (8 references)

A study was undertaken to determine the residues of some organophosphate insecticides, viz. phorate, disulfoton, diazinon, and dimethoate, in the fruits and foliage of brinjal and cowpea grown in soils treated with these compounds. The insecticides were applied twice at 2 kg ai/ha. In brinjal the first application was given about a week after seedlings were transplanted, followed by the second application about 3 weeks later. In cowpea, the first treatment was applied 2 days before weed sowing and the second just before the initiation of flowering. Plant samples were collected at 10, 20, and 30 days following the last treatment. The level of phorate and disulfoton in the brinjal stems and leaves remained above 1 ppm till 20 days from the date of soil treatment. The levels decreased by 30 days. The residues were mostly higher in the leaves than in the stems or fruit. This was also true for diazinon. At 20 days the recovery of diazinon from the stem (0.535) and fruit (0.395 ppm) were quite low, indicating its rapid degradation within the brinjal plants. Even at ten days after application, the level of diazinon in the fruit was below the tolerance limit fixed by the US FDA. The level of phorate and disulfoton residues in the fruits, however, dropped below tolerance only a month after soil treatment. Cowpea residues of phorate and disulfoton in leaves and fruits remained above tolerance for 3 weeks after treatment.

There was only a low concentration in the pods, however, implying that soil treatment with these two insecticides is not likely to create any serious residue hazards if the pods are consumed about 3 weeks after treatment. Dimethoate is considered safer as its residue in pods is much below the tolerance even at the 10 day interval. A month after soil treatment, the toxic residues of all the insecticides in the plant samples were strikingly low, 0.200 to 0.575 ppm. It is concluded from this data that the biological persistence of dimethoate and diazinon in brinjal and cowpea plants is of a shorter duration that that of phorate and disulfoton. The residue of diazinon in brinjal fruits was less than half that in cowpea pods at 10 days after soil treatment. This indicates that the rate of biochemical degradation of the toxicant differs considerably from plant to plant.

75-2961. Ivie, G. W. (Vet. Toxicol. Entomol. Res. Lab., Agric. Res. Serv., USDA, College Station, TX 77840). **Metabolic fate of perfluidone herbicide in a lactating cow.** *J. Agric. Food Chem.* 23(5): 869-872; 1975. (4 references)

Perfluidone (1,1,1-trifluoro-*N*- [2-methyl-4-(phenylsulfonyl) phenyl-^{14}C] methanesulfonamide) was administered at 5 mg/kg as a single oral dose to a lactating cow. Radiocarbon was rapidly and essentially quantitatively excreted during a 7-day post-treatment period. About 80% of the administered dose appeared in urine, about 20% was recovered in feces, and only 0.1% of the dose was secreted into the milk. Unmetabolized perfluidone accounted for 90-95% of the total radiocarbon present in the urine and milk, and the remaining radioactivity was mainly in the form of two metabolites hydroxylated at the 3 or 4 positions of the phenylsulfonyl ring. These products were excreted almost totally in nonconjugated form. The major urinary metabolite and the only milk metabolite was 4-hydroxyperfluidone, whereas perfluidone and its 3-OH and 4-OH derivatives occurred in approximately equal amounts in feces. (Author abstract reprinted by permission of the American Chemical Society)

75-2962. Weisgerber, I.; Bieniek, D.; Kohli, J.; Klein, W. (Inst. Oekol. Chem., Gesellschaft Strahlen- und Umweltforsch., Munich, Germany). **Isolation and identification of three unreported photodieldrin-^{14}C metabolites in soil.** *J. Agric. Food Chem.* 23(5): 873-877; 1975. (35 references)

Fifteen months after application of photodieldrin-^{14}C to soil (5 ppm of dry weight) in the open air, the following conversion products were identified by TLC, GLC, and mass spectrometry: the bridged isomer of dihydrochlordene dicarboxylic acid (1,7,8,*exo*-9,10,10-hexachlorotetracyclo- $[5.2.1.0^{26}.0^{48}]$ decane -3,5-*exo,exo*- dicarboxylic acid), amounting to about 0.5% of recovered radioactivity; a methoxylated derivative of this acid, amounting to about 0.5% of recovered radioactivity; and a bridged isomer of *trans*-4,5-dihydroxy -4,5-dihydroaldrin (3,*exo*-4,5,6,6,7- hexachloro-11,12- *trans*-dihydroxypentacyclo $[6.4.0.0^{210}.0^{370^{59}}]$ dodecane), amounting to about 1% of recovered radioactivity. (Author abstract reprinted by permission of the American Chemical Society)

75-2963. Yu, C. C.; Booth, G. M.; Hansen, D. J.; Larsen, J. R. (Dep. Entomol., New York State Agric. Exp. Stn., Geneva, NY 14456). **Fate of alachlor and propachlor in a model ecosystem.** *J. Agric. Food Chem.* 23(5): 877-879; 1975. (10 references)

Ring-^{14}C-labeled alachlor [2-chloro-2',6'-diethyl-*N*-(methoxymethyl)acetanilide] and propachlor (2-chloro-*N*-isopropylacetanilide) were studied in a model ecosystem designed by R. L. Metcalf and associates. These two herbicides were transformed into many compounds in water over the experimental period of 33 days. According to thin-layer chromatographic and radioautographic analyses, at least eight alachlor degradation products and seven propachlor degradation products were found in the water. Alachlor and propachlor constituted only 1.8 and 0.4%, respectively, of the radioactivity in the water at the end of the experiment. Thus, it appears that these two herbicides are labile under an aquatic environment. No parent compounds were detected in the organisms and there was no evidence to indicate that their metabolites or degradation products were magnified in the food chain. (Author abstract reprinted by permission of the American Chemical Society)

75-2964. Vesterberg, O. (Chem. Div., Occup. Health Dep., Natl. Board Occup. Safety Health, Stockholm, Sweden). **General aspects on biotransformation and elimination of organic compounds in connection with occupational exposure.** *Int. Arch. Occup. Environ. Health* 35(2): 89-115; 1975. (69 references)

The common pathways for biotransformation of foreign organic compounds are reviewed. Arguments are presented which call for research and detailed studies on biotransformation. The different pathways for biotransformation which are considered include, under nonsynthetic reactions, oxidation, reduction, and hydrolysis. Under synthetic reactions, the conjugation with amino acids and peptides, sulfation, methylation, and acetylation are discussed. Increased understanding of the pathways involved in biotransformation of individual chemicals allows potential risks either for increased toxicity or for other toxicological effects such as the initiation of cancer to be anticipated. The factors which can influence the capacity for and consequences of biotransformation are genetic factors, competition of agents in biotransformation, organ impairment, other agents in the work environment, and the presence of other chemicals such as drugs, foods, or cigarette smoke. General consequences of altered or abnormal biotransformation capacities are considered. It is generally stated that decreased capacity for biotransformation may involve a higher risk than induction for sudden effects. The elimination of chemical agents and

their biotransformation products takes place via the lungs, liver, bile, kidney, and urine.

75-2965. Sikka, H. C.; Ford, D.; Lynch, R. S. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY 13210). **Uptake, distribution, and metabolism of endothall in fish.** *J. Agric. Food Chem.* 23(5): 849-851; 1975. (5 references)

When bluegills were exposed in aquaria to water containing 2 ppm of [^{14}C]endothall, less than 1% of the herbicide was absorbed by the fish. The maximum concentration of endothall in the fish (0.1-0.2 ppm) was observed 12 hr after treatment; thereafter it did not change significantly up to 96 hr. Radioactivity was detected in viscera, flesh, scales, skin, and head. At all sampling times, the concentration of ^{14}C residues was highest in the viscera and lowest in the flesh. A small but detectable amount of ^{14}C was found in the blood 30 min after treatment. The herbicide was also absorbed by the fish when fed through the digestive tract. The fish did not metabolize endothall during the 48 hr after treatment. (Author abstract reprinted by permission of the American Chemical Society)

75-2966. Archer, T. E. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616). **Dissipation of parathion and related compounds from field-sprayed lettuce.** *J. Agric. Food Chem.* 23(5): 858-860; 1975. (5 references)

In June, 1974 in Yolo County, California, duplicate plots of Climax lettuce were sprayed at the rate of application of active ingredient of 0.5 lb and 1 lb per acre 7 days before harvest with Thiophos-parathion 4 E.C. A control plot was also established and sampled before the other plots were sprayed and daily thereafter with the sprayed plots. The sprayed lettuce was analyzed for parathion and related compounds as the field head, trimmed head, and trimmings from the initial day of pesticide application through the harvest sample, 7 days later at both rates of spray application. To determine the depth of penetration and amounts of residue present at each level within the head of the field lettuce, the outer 12 leaves were analyzed as a composite, the next 6 inner leaves, the next 6 inner leaves, and the remaining head. The sum total residues of parathion and related compounds on the untrimmed harvested lettuce samples 7 days after pesticide application were below the tolerance level of 1 ppm at the 0.5 lb rate of active ingredient per acre spray application. The trimmed heads at both rates of pesticide application were below 1 ppm residue levels at harvest. (Author abstract reprinted by permission of the American Chemical Society)

75-2967. Reddy, G.; Khan, M. A. Q. (Dep. Biol. Sci., Univ. Illinois at Chicago Circle, Chicago, IL 60680). **Metabolism, excretion, and tissue distribution of [^{14}C]photodieldrin in male rabbits, following single oral and intraperitoneal administration.** *J. Agric. Food Chem.* 23(5): 861-866; 1975. (36 references)

Metabolism, excretion, and tissue distribution of [^{14}C]photodieldrin were studied in male rabbits following single oral and intraperitoneal treatments. About 55 to 60% of the administered dose was eliminated in the urine and 1 to 3% was excreted in the feces, in 9 days, in oral or intraperitoneal treated rabbits. Less than 1% radioactivity of urine and feces was extractable in the organic phase showing that most of it was water soluble or conjugated in nature. All 23 tissue samples obtained at autopsy, 9 days after the treatment, showed a minimum of 0.001% of the given dose. Higher concentrations of ^{14}C residues were found in fat followed by liver and then other tissues. Relatively higher concentrations of residues were present in tissues of intraperitoneally treated animals. Analysis of the organic extract of the urine, feces, and liver by TLC showed the presence of seven metabolites along with photodieldrin. Kidney extracts showed, along with photodieldrin, only two of the metabolites detected in urine, feces, and liver. Quantitative analyses of water-soluble and conjugated radioactive photodieldrin or its metabolites, present in the urine, feces, liver, and kidney, were performed after their enzyme and acid hydrolysis. (Author abstract reprinted by permission of the American Chemical Society)

75-2968. Lu, P. Y.; Metcalf, R. L.; Hirwe, A. S.; Williams, J. W. (Dep. Entomol., Inst. Environ. Stud., Univ. Illinois, Urbana-Champaign, IL 61801). **Evaluation of environmental distribution and fate of hexachlorocyclopentadiene, chlordane, heptachlor, and heptachlor epoxide in a laboratory model ecosystem.** *J. Agric. Food Chem.* 23(5): 967-973; 1975. (27 references)

The distribution and fate of [^{14}C]heptachlor and the organochlorine compounds closely associated with it in manufacture and use, hexachlorocyclopentadiene, chlordene, and heptachlor epoxide, have been evaluated in food chain organisms in two laboratory model ecosystems and in vitro by sheep liver microsomes. Chlordene and heptachlor undergo epoxidation rapidly and are also hydroxylated at C_1 to form the corresponding hydroxy analogs. Heptachlor epoxide, however, is highly stable in biological systems. The rates of conversion and degradation of these compounds are influenced by microsomal oxidases, photolysis, and chemical hydrolysis. The relative balance of the epoxidation, an intoxication, and hydroxylation, a detoxication, determines the magnitude of persisting residues in the environment. (Author abstract reprinted by permission of the American Chemical Society)

75-2969. Holloman, M. E.; Layton, B. R.; Kennedy, M. V.; Swanson, C. R. (Dep. Biochem., Mississippi State Univ., Mississippi State, MS 39762). **Identification of the major thermal degradation products of the insecticide mirex.** *J. Agric. Food Chem.* 23(5): 1011-1012; 1975. (8 references)

The thermal decomposition of mirex has been studied at temperatures up to 700°. Infrared, mass spectral,

gas chromatographic, and ultraviolet data were used to establish that hexachlorobenzene was the major thermal degradation product. Hexachlorocyclopentadiene was also found in small amounts in the thermal residue. The products identified from the vapor phase were carbon monoxide, carbon dioxide, hydrogen chloride, chlorine, carbon tetrachloride, and phosgene. (Author abstract reprinted by permission of the American Chemical Society)

75-2970. Yu, C.; C. Booth, G. M.; Larsen, J. R. (Dep. Entomol., New York State Agric. Exp. Stn., Geneva, NY 14456). **Fate of triazine herbicide cyanazine in a model ecosystem.** *J. Agric. Food Chem.* 23(5): 1014-1015; 1975. (6 references)

[ring-^{14}C]Cyanazine [2-(4-chloro-6- ethylamino-*s*-triazin-2-ylamino) -2- methylpropionitrile] was introduced into an aquatic model ecosystem. After 35 days in this ecosystem, the radioactivity in water was found to consist of 60% *N*-deethylcyanazine [2-(4-chloro -6- amino-*s*-triazin -2- ylmino) -2- methylpropionitrile], 18% cyanazine, 0.8% cyanazine amide [2-(4-chloro-6-ethylamino-*s*-triazin -2- ylamino) -2- methylpropionamide], 0.3% *N*-deethylcyanazine amide [2-(4-chloro -6- amino *s*-triazin -2- ylamino) -2- methylpropionamide], 1.2% unknown polar metabolites, and 19% ether-unextractable metabolites. Radioactivity was persistent in water indicating degradation of the triazine ring to CO_2 proceeded slowly. However, cyanazine and its degradation products did not concentrate through the food chain. The total equivalent of radioactivity in the aquatic organisms ranged from 1.3 ppm in algae [*Oedogonium cardiacum* (Huss.)] to 0.05 ppm in fish (*Gambusia affinis* Baird and Girard) and 0.04 ppm in *Daphnia magna* Strauss. About 0.2 ppm of *N*-deethylcyanazine was found in the crabs (*Uca minax*), but no cyanazine was detected. (Author abstract reprinted by permission of the American Chemical Society)

75-2971. Romminger, K. (Zentrale Lebensmittelhyg. Untersuchungsstelle, Berlin, DDR). **Stand und Moeglichkeiten der Ueberwachung von landwirtschaftlichen Produkten durch die Hygiene-Institute der Bezirke. [Present situation and possibilities of farm produce control by the hygiene institutes of the counties.]** *Nachrichtenbl. Pflanzenschutzdienst DDR* 29(6): 129-131; 1975. (German)

State of the art reports on pesticide residue controls in farm produce at regional hygiene insitututes of East Germany are presented. Maximum allowable residue concentrations have been set for 120 to 130 pesticides in different kinds of food. Zero tolerance implies residue levels below 0.1 mg/kg for relatively harmless pesticides, levels below 0.02 mg/kg for moderately hazardous pesticides, and levels below 0.04 mg/kg for hazardous pesticides. Both the tolerance values and the waiting periods required between pesticide application and harvesting are regularly modified in the light of new data. Analytical methods for pesticide residue investigations are increasingly standardized. The overall degree of food contamination with pesticides is currently estimated at 26%. Residue levels in excess of the maximum allowable concentration are usually due to improper application technique, especially to aerial distribution of pesticides.

75-2972. Harvey, G. R.; Steinhaver, W. G.; Miklas, H. P. (Woods Hole Oceanographic Inst., Woods Hole, MA 02543). **Decline of PCB concentrations in North Atlantic surface water.** *Nature (London)* 252(5482): 387-388; 1974. (9 references)

Concentrations of PCB in the North Atlantic surface waters have dropped 40-fold since 1972. Data shows a 10-fold decrease of PCB in the atmosphere over the Northwest Atlantic since 1973, and a 5-fold decrease since 1972 in the PCB content of mixed plankton collected along 09°N latitude in September of 1973. This data indicates that about 2×10^4 tons of PCB were lost from the upper 200 m of water in less than 1 yr. Four processes must be considered: dilution of dissolved PCB by vertical and horizontal advection and diffusion, association of PCB with sedimenting particles, evaporative codistillation into the atmosphere, and biological and chemical degradation. Comparing this data with that observed from monitoring bomb fallout radionuclides suggests that depletion of dissolved PCB from the upper ocean by advection and diffusion is too slow to explain the observed rate. The well known affinity of PCB for solid surfaces suggests that adsorption of falling particles could be a major transfer mechanism. Evaporative codistillation and biogeochemical degradation can not at this time be accurately determined.

75-2973. Van Himme, M. (Fac. Landbouwwet., Rijksuniv. Gent, Ghent, Belgium). **Konsekwenties van herbicidentoedieningen voor het milieu. [Environmental consequences of herbicide use.]** *Parasitica* 30(3): 87-99; 1974. (7 references) (Dutch)

Studies on the persistence of herbicides in soil, groundwater, water bodies, and plants, as well as the effects of pesticides on soil microorganisms, fauna, and humans are reviewed. Unlike cyanazine and alachlor, TCA sodium, tetrapion sodium, picloram, lenacil, napropamide, propyzamide, and certain triazine and urea derivatives are persistent in the soil, thereby affecting later crops. Picloram, 2,4,5-T, 2,4-D, amitrole, diclobenil, diuron, and triazines are more or less persistent in water. Mecoprop, dichlorprop, and picloram are highly persistent in plants, while amitrole, MCPA, and 2,4-D usually cause no residue problems. Most herbicides cause only short-term depression of the soil microorganisms, of which nitrifying bacteria are most susceptible and ammonifying bacteria and nitrogen oxidizing microbes are most resistant. Dinoseb acetate, simazine, phenylurea derivatives, TCA, linuron, and metobromuron exert fungicidal activity in the soil. Dinoseb and DNOC are toxic for bees and game. The 2,3,7,8-tetrachlorodibenzo *-p-* dioxin present in 2,4-D and 2,4,5-T has teratogenic effects. Amitrole was found to be

toxic for the thyroid gland in animal tests. It represents no hazards for humans, however, due to its low residue levels in plants.

75-2974. Floru, S.; Polizu, A.; Ripeanu, M.; Cusa, S. (Inst. Cercet. Prot. Plant., Acad. Stiinte Agr. Silv., Bucharest, Romania). **Reziduuri de HCH in laptele de oaie in urma imbaierilor cu entomoxan. [BHC residues in ewe's milk following entomoxan dips.]** *An. Inst. Cercet. Prot. Plant., Acad. Stiinte Agr. Silvice* 9: 587-592; 1973. (5 references) (Romanian)

BHC residue levels were followed over a 4-month period in milk from ewes treated by dipping with Entomoxan (0.4% BHC) and from untreated ewes. Residues declined slightly from ca. 2.5 ppm to ca. 1.7 ppm between the last weeks that the sheep were kept in the stable to mid-June, after they had been on pasture for 1.5 mo and were dipped for tick control. Residues in the milk of the untreated sheep continued to decline slightly, remaining just above 1 ppm through August. Residues in the dipped sheep rose almost to 3 ppm on the average (4 ppm max.) by 15 days after the second dipping, but declined rapidly, approaching control levels by 1 mo after dipping. It was apparent that most of the BHC residues in sheep's milk originated from feed contamination. Lindane residues decreased more rapidly than alpha-BHC residues after sheep dipping.

75-2975. Griffith, F. D., Jr.; Blanke, R. V. (Div. Consolidated Lab. Serv., Commonwealth of Virginia, Richmond, VA 23219). **Blood organochlorine pesticide levels in Virginia residents.** *Pestic. Monit. J.* 8(4): 219-224; 1975. (22 references)

This study attempts to establish 1972 baseline levels for 31 organochlorine pesticides and industrial chemicals in postmortem human whole blood in Virginia. These pesticides and industrial chemicals have been detected previously in other parts of the food chain and environment. In the present study DDT and its metabolites, DDE and TDE, were detected most frequently and at highest levels. DDT and DDE tended to appear more frequently as people grew older although TDE levels remained constant. Dieldrin and lindane showed peak levels in the middle age group. Analyzing distribution of pesticides in blood by sex showed that females had higher levels of lindane and dieldrin and males had higher levels of DDT, DDE, and TDE. Analyzing racial distribution showed blacks with higher levels of DDT, TDE, and DDE and indicated little difference from whites for lindane and dieldrin. Higher levels were found in Richmond and Norfolk than in the Fairfax and Roanoke regions. (Author abstract by permission)

75-2976. McIntosh, A. W. (Dep. Bionucleonics, Purdue Univ., West Lafayette, IN 47906). **Fate of copper in ponds.** *Pestic. Monit. J.* 8(4): 225-231; 1975. (13 references)

Treatments of 3 ppm copper sulfate were applied to two small aquatic systems in Michigan in 1971. To study the pathways of the added copper, samples of water, sediment, aquatic macrophytes, filamentous algae, and fish were collected and analyzed by atomic absorption. Sampling was initiated before treatment and continued up to 4 months in one of the ponds. Dissolved copper concentrations in water decreased rapidly immediately after treatment and then gradually to background levels. Reduction of dissolved copper may have involved initial precipitation of an insoluble compound, such as malachite, followed by sediment adsorption of soluble copper complexes and copper released from aquatic plants. Levels of copper in sediment increased rapidly at first and gradually later in the study. Aquatic plants and filamentous algae accumulated very high levels of copper. Uptake rates were apparently affected by water temperature and growth stages of the plants. Data indicates that aquatic macrophytes developing in one pond 10 weeks after treatment took up copper from the sediment. Although green sunfish (*Lepomis cyanellus*) accumulated copper soon after treatment, levels returned to background later in the study. (Author abstract by permission)

75-2977. Pecka, Z.; Baulu, P.; Newsome, H. (Quebec Reg. Lab., Health Protect. Branch, Dep. Natl. Health and Welfare, Longueuil, Quebec, Canada). **Preliminary survey of ethylenethiourea residues in the Canadian food supply, 1972.** *Pestic. Monit. J.* 8(4): 232-234; 1975. (9 references)

A preliminary monitoring program was initiated in 1972 to determine ethylenethiourea (ETU) content of the Canadian food supply. Of 167 samples analyzed, 90 were domestic and 77 were imported. Samples were analyzed by electron-capture/gas-liquid chromatography. Thirty-three percent of the samples contained detectable ETU residues; most of these were 0.020 ppm or less. Highest levels, 0.047 and 0.083 ppm, were found in canned spinach and orange peel, respectively. (Author abstract by permission)

75-2978. Crockett, A. B.; Wiersma, G. B.; Tai, H.; Mitchell, W. (Natl. Environ. Res. Cent., E.P.A., Las Vegas, NV 89114). **Pesticide and mercury residues in commercially grown catfish.** *Pestic. Monit. J.* 8(4): 235-240; 1975. (10 references)

In 1970, 54 commercial catfish farms in Arkansas and Mississippi were sampled for pesticide and mercury residues. Pesticide residues above FDA action levels were detected in 15 percent of the fish samples. Data on residues in sediment, fish feed, and source water suggests that fish were not being contaminated from these sources. Average fish residue per county was, however, strongly correlated with the percent of total acres planted in cotton and soybeans. Results strongly suggest that cotton production was the primary source of contamination. Actual routes of movement have not been clearly defined but aerial transport seems most probable. (Author abstract by permission)

75-2979. Fredeen, F. J. H.; Saha, J. G.; Balba, M. H. (Res. Stn., Canada Dep. Agric., Saskatoon, Saskatchewan, Canada). **Residues of methoxychlor and other chlorinated hydrocarbons in water, sand, and selected fauna following injections of methoxychlor black fly larvicide into the Saskatchewan River, 1972.** *Pestic. Monit. J.* 8(4): 241-246; 1975. (9 references)

In May 1972, 0.309 ppm methoxychlor black fly larvicide was applied in a single test on the North Saskatchewan River. Eight to nine days later residues of 0.05-0.10 ppm methoxychlor occured in sand 21-22 km downstream from the point of injection. Methoxychlor was not detected in water, insect larvae, shellfish, or muscle tissues of three fish species on the same sampling date. Perhaps because of relatively high oil content in goldeye fish, methoxychlor residues in muscle tissues were 1.0-1.5 ppm in 8 percent of those sampled, 0.21-0.99 in 21 percent, and 0.02-0.20 in 37 percent. In 34 percent of the goldeye fish no residues were detected. Goldeye and other fish collected before or 17 weeks after this injection did not contain detectable levels of methoxychlor. River water in two samples of the injected slug of water collected 6.5 km downstream from the point of injection contained 0.14 and 0.16 ppm methoxychlor. The suspended solids filtered from these samples contained 40 and 47 percent of this methoxychlor (437 and 892 ppm, respectively). Thus methoxychlor may act selectively against filter-feeding species, expecially black fly larvae. (Author abstract by permission)

75-2980. Nickerson, P. R.; Barbehenn, K. R. (Div. Tech. Assistance, Fish Wildl. Serv., U.S.D.I., Washington, DC 20240). **Organochlorine residues in starlings, 1972.** *Pestic. Monit. J.* 8(4): 247-260; 1975. (5 references)

During the fall of 1972 starlings were collected from 130 sites in conjunction with the National Pesticide Monitoring Program. They were analyzed for DDT and its metabolites, dieldrin, heptachlor epoxide, benzene hexachloride, polychlorinated biphenyls and, for the first time in the series, oxychlordane and HCB. Mean DDT and dieldrin residue levels have declined significantly since 1967 and a regression analysis suggests that levels of DDT and its metabolites should fall below a mean of 0.1 ppm for 1974 starling collection. (Author abstract by permission)

75-2981. Anas, R. E.; Worlund, D. D. (Northwest Fish. Cent., Natl. Mar. Fish. Serv., Natl. Oceanic Atmos. Adm., Seattle, WA 98112). **Comparison between two methods of subsampling blubber of northern for seals for total DDT plus PCB's.** *Pestic. Monit. J.* 8(4): 261-262; 1975. (10 references)

Samples of 100 g blubber were collected from each of twelve 8- to 13-year-old fur seals (*Callorhinus ursinus*) taken off the coast of Washington State in March 1972. Two methods of subsampling the blubber were compared. The mean level of total DDT (DDE, DDD, and DDT) plus polychlorinated biphenyls (PCBs) from a 5-g chunk of blubber taken from a 100-g sample was significantly less than the mean level from a 5-g subsample taken from the remainder of the blubber sample after it had been thoroughly ground. Total DDT plus PCB residues ranged from 5.66 to 72.17 ppm, with a mean of 23.69 ppm in the chunks, and from 5.33 to 95.70 ppm, with a mean of 28.64 ppm in the homogenized blubber. (Author abstract by permission)

75-2982. Winterlin, W.; Bailey, J. B.; Langbehn, L.; Mourer, C. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616). **Degradation of parathion applied to peach leaves.** *Pestic. Monit. J.* 8(4): 263-269; 1975. (11 references)

Parathion was applied to peach trees in three different formulations 70 days before harvest. Leaf samples were taken periodically through the 70-day period and gas-liquid chromatographic analyses were conducted for dislodgable and penetrated residues. Analyses were also conducted for paraoxon and the *S*-ethyl isomer of parathion. Punched samples were compared to whole-leaf samples; generally residue levels for both types corresponded closely. A new experimental formulation, encapsulated parathion, produced highest levels of total parathion throughout the 70-day study, but even this formulation resulted in low total residue levels around 1 ppm at time of harvest. Degradation of the *S*-ethyl isomer of parathion was generally very rapid in all formulations studied. Dislodgable residues of paraoxon may be significant in some formulations and should be included in parathion degradation studies. Much of the parathion found on peach leaves throughout the growing season was dislodgable residue, but this depended considerably on the formulation used. (Author abstract by permission)

75-2983. Belles, W. S. (U.S. Borax Res. Corp., Anaheim, CA). **Leaching and run-off of dinitramine under laboratory conditions.** *Proc. West. Soc. Weed Sci.* 27: 34-39; 1974.

Studies in the laboratory on soil types ranging from a fine sand to a silty loam indicated that dinitramine is not appreciably leached from the soil. In the tests 90% or more of the applied dinitramine-7-^{14}C was retained by these soils in the top 4 cm despite the passage of an equivalent of ten acre inches of water. Water (5 in/acre) leached through columns of a sandy loam, silty loam, and silty clay loam bore no radioactivity when it was recovered. Water (10 acre inches) added to columns of a fine sand soil did register dinitramine in the concentration of 0.02 ppm in the leachate. Repetitive leaching with daily additions of 0.5 in/acre of water from 25 to 45 days after dinitramine treatment showed that the chemical and its metabolites are not readily leached from the soil. The application of water equivalent to 4 inches of rain to a fine sand soil on a 10° slope indicated dinitramine was not moved appreciably. The run-off water contained less than 1 ppb dinitramine. The results of this experimentation allow the conclusion

that only in cases of extreme soil erosion following application would significant amounts of dinitramine be moved from the site of application.

75-2984. Goswami, K. P.; Green, R. E. (Univ. Hawaii, Honolulu, HI). **Soil and sugarcane contributions to the degradation of ametryne.** *Proc. West. Soc. Weed Sci.* 27: 39; 1974.

The herbicide-plant-soil system involved in herbicide degradation must be studied as a whole in order to properly evaluate important interactions between plant roots and soil. Such a combined study has been carried out for the degradation of ametryne, 2-methylthio -4-ethylamino -6- isopropylamino-*s*-triazine. In Hydrandept and Torrox soils without plants, ametryne residues at 60 days were 45% and 65%, respectively. In autoclaved soils, 95% of ametryne remained. Evidence of degradation indicated a predominantly microbial breakdown of ametryne in the non-autoclaved soils. In nutrient solution, sugarcane roots rapidly converted ametryne to polar breakdown products with degradation proceeding via dealkylation. The 2-hydroxy analog of ametryne was not a major product. In the soil-sugarcane system, only 8% of the applied ametryne remained after 60 days. A larger quantity of labeled carbon dioxide was evolved from the soil-root portion relative to that evolved from the shoot. The presence of sugarcane roots in the soil increased de-ethylation of ametryne and also hydrolysis at the 2-position.

75-2985. Guillot, G. (C.E.G.F., Paris, France). **Pollution chimique eventuelle des produits surgeles.** [**Chemical pollution of deep-frozen products.**] *Rev. Gen. Froid* 7: 637-646; 1975. (39 references) (French)

Studies and observations are reviewed on the effect of different processing steps and of deep-freezing on the residue dynamics of pesticides and other contaminants in fruits and farm produce. Residues of phosphamidon, captan, parathion, and other pesticides were found in fruits and farm produce before and after processing in several countries on several occasions. Dressing, washing, and bleaching usually reduce the pesticide residue levels considerably. Organophosphorus pesticides are eliminated by these processes more easily than organochlorine residues because the former penetrate into plants less deeply. Except for captan, fungicides are eliminated by processing most easily. Deep-freezing does not modify the pesticide residue levels practically.

75-2986. Le Nir, J.; Roudaut, R. (Lab. Coop. Agric. Bretagne, Landerneau, France). **Incidence des traitements technologiques sur la teneur en residus de pesticides organo-chlores sur des legumes traites en usine de surgelation.** [**Influence of technological treatment on the organochlorine pesticide residues on vegetables treated in frozen food production.**] *Rev. Gen. Froid* 7: 647-650; 1975. (6 references) (French)

The effect was studied of different processing steps on the lindane, α-BHC, β-BHC, aldrin, and heptachlor epoxide residue contents in spinach, green beans, peas, brussels sprouts, turnips, cauliflowers, carrots, salsify, and small kidney beans. It was possible to eliminate up to 57% of the residue by dressing while washing either decreased or increased the residue levels depending on the quantity of water used. Bleaching eliminated 60-83% of the residues. Lindane showed hardly any degradation in water, even at high temperature. Peeling reduces the residue level by 50-77% in root produce. Deep-freezing caused practically no abatement of the residue levels.

75-2987. Sunami, S. (Dept. Public Health, Kawasaki Med. Coll., Kawasaki, Japan). **A study of the thermal conditions and** γ-BHC concentration after spraying in the vinyl-greenhouse. *J. Sci. Labour Part 2* 50(9): 663-671; 1974. (20 references)

Among farmers engaged in forcing culture in Japan, the vinyl-greenhouse syndrome is not uncommon. It is felt that the syndrome should be attributed to the environmental factors in these vinyl greenhouses. A model house was constructed, including a rest-room, for the purpose of studying the environmental conditions in the vinyl-greenhouse. Measurements of thermal conditions and γ-BHC concentration in the air were made after spraying. The temperature in the work room was highest, next was the temperature of the rest room, and lowest was the outdoor temperature. The rest room was free from pollution with agricultural chemcals when the fan in that room was operating. However, the operation of this fan had no effect on the concentration of γ-BHC in the work room. At five hours after spraying the concentration of γ-BHC in the rest room was half that in the work room.

75-2988. Bronisz, H.; Podolak, M. (Dep. Chem. Toksykol., Inst. Anal. Technol. Farm., Akad. Med., Lublin, Poland). **Pozostalosci rteci w jajach kurzych w wojewodztwie Lubelskim.** [**Mercurial residues in chicken eggs in the province of Lublin.**] *Roczn. Panstw. Zakl. Hig.* 26(4): 489-495; 1975. (17 references) (Polish)

Investigations to determine mercurial residues and to trace various monthly mercury concentrations in chicken eggs, an important Polish food product, are reported. A modification of the method recommended by the State Institute of Hygiene is used. Mercury was determined as mercury dithionate by a photocolorimeter at 485 nm wavelength with a 12 mm absorption layer. Eggs provided by the Lublin Egg and Poultry Plant were examined in March, May, July, and September, 1973. A total of 73 determinations were made and repeated twice. Mean mercury content was highest in May (0.028 mg/kg) and the mean value of all experiments was 0.023 mg Hg/kg.

75-2989. Wellenstein, G. (Forstzool. Inst., Univ. Freiburg i. Breisgau, Germany). **Unerlaubt hohe Pestizid-**

Rueckstaende in Waldbeeren. [Inadmissibly high pesticide residues in berries found in forests.] *Umschau Wiss. Tech.* 75(16): 510-512; 1975. (16 references) (German)

Residues of 2,4-D and 2,4,5-T derivatives, herbicides approved for use in West Germany without toxicological classification, were determined in forest plants and in berries and mushrooms growing in forests following aerial application over wooded areas. The residues found in raspberries one week after 2,4,5-T application exceeded the maximum allowable level of 0.05 mg/kg by 38 to 144 times, and in blackberries by 83 times. The residue levels found in berries and mushrooms 4 weeks after herbicide application exceeded the maximum allowable content by 16 to 128 times. Forest trees contained residues well above the maximum allowable residue level in food even after one year. The 2,4,5-T residues in plants from adjacent areas averaged 0.009 mg/kg. The findings prompt feeding tests on animals for the determination of the effects of phenoxyacetic acid derivatives.

75-2990. Suzuki, M.; Yamato, Y.; Akiyama, T. (Kitakyushu Inst. Environ. Health Sci., Kitakyushu, Japan). **BHC (1,2,3,4,5,6-hexachlorocyclohexane) residue concentrations and their seasonal variation in aquatic environments in the Kitakyushu district, Japan, 1970-1973.** *Water Res.* 8(9): 643-649; 1974. (21 references)

The levels of BHC concentration in river and reservoir surface water and tap water of the Kitakyushu District, Japan, for 1970—1973 and the correlation of the BHC concentration between surface water and river bottom sediments were investigated. The BHC concentration in surface, reservoir, and tap water changed seasonally. The concentration of BHC was high in summer due to runoff from flooded paddy fields and rain water containing BHC codistilled, evaporated, and volatilized from soil surfaces and entering rivers. In autumn, winter, and spring the concentration of BHC was low. BHC in surface water was partitioned with water, suspended materials, and bottom sediments. The hydrophobic pesticide was especially absorbed by and concentrated in bottom sediments. Residue levels in bottom sediments were correlated to their organic matter content. The γ-BHC concentration revealed by this study in surface waters of rivers and tap water was higher than previous reports have indicated. As for the total BHC level, the current results showed much higher concentrations than had previously been demonstrated.

75-2991. Knoppler, H. O. (Bavarian Animal Health Service, Grub, Germany). **Arsenrueckstaende in Leberproben von Schweinen, Laemmern und Gefluegel sowie in Eiern. [Arsenic residues in livers of swine, lamb, and fowl and in eggs.]** *Z. Lebensm.-Unters.-Forsch.* 157(5): 277-280; 1975. (14 references) (German)

The arsenic content of 3,651 swine, 180 lamb, and 175 poultry liver samples, and of 420 egg lots, all collected from Bavarian farms during the 1973-1974 period, was analyzed colorimetrically. The maximum allowable arsenic concentration of 0.5 mg/kg was exceeded in 45 swine liver samples (1.23%), which was due to arsenic treatment of the animals shortly before slaughtering in about 50% of these cases. The arsenic residues were below 0.01 in 1,233 samples. Comparative analyses showed that the arsenic contents in the liver are higher than those in kidneys and meat. The highest arsenic level found in lamb livers was 0.36 mg/kg, i.e., the maximum allowable concentration was not reached in any sample. The arsenic content was below 0.5 mg/kg in all chicken liver samples, while arsenic levels above the maximum allowable concentration of 0.1 mg/kg were found in 1.67% of all egg samples.

75-2992. Wallnoefer, P.; Koeniger, M.; Engelhardt, G. (Bayerische Landesanstalt fuer Bodenkultur und Pflanzenbau, Abt. Pflanzenschutz, Munich, Germany). **Verhalten von xenobiotischen chlorierten Kohlenwasserstoffen (HCB und PCBs) in Kulturpflanzen und Boeden. [Fate of xenobiotic chlorinated hydrocarbons (HCB and PCBs) in plants and soils.]** *Z. Pflanzenkr. Pflanzenschutz* 82(2): 91-100; 1975. (10 references) (German)

The uptake of BHC and 5 different PCBs from contaminated soil by carrots, radishes, and sugar beets, and the metabolism of ^{14}C-labeled 2,2',5-trichlorobiphenyl in carrots were studied under greenhouse and field conditions. The BHC concentrations in the soil in greenhouse experiments decreased from 0.044 to 0.028 ppm, from 0.40 to 0.30 ppm, and from 3.95 to 2.2 ppm in 120 days. Radishes contained 0.025 ppm BHC when grown in soil treated with 5 ppm BHC, while carrots contained 0.05 ppm BHC in soil treated with 0.5 ppm, and 0.5 ppm BHC in soil treated with 5 ppm BHC. While almost all residue in carrots was localized in the peels, the substantially lower residues in radishes were distributed evenly over the entire root body. Sugar beets grown in a soil with an initial BHC concentration of 0.3 ppm contained 0.053 ppm BHC in the peels, 0.008 ppm in the peeled beet, and 0.003 ppm in leaves after 73 days. No metabolism of PCB in carrots was observed.

75-2993. Ruland, S. (Institut fuer Phytopathologie, Kiel, DDR). **Untersuchungen ueber die Verteilung und Persistenz von Nitralin und Trifluralin in Rapskulturen und Boden. [The distribution and persistence of nitralin and trifluralin in rape and soil.]** *Z. Pflanzenkr. Pflanzenschutz* 82(4): 212-225; 1975. (24 references) (German)

The migration, distribution and persistence of nitralin and trifluralin in soil and rape plant were studied following shallow soil application or spraying. Some 20% of the normal initial dose was found in the soil after 11 months. The vertical migration of the herbicides was slight as 80% of the residue was found in the upper 5 cm soil layer, 15% in the 5-10 cm layer, and only traces between 10 and 20 cm. While trifluralin was found almost exclusively in the roots, nitralin was translocated also into the aerial parts, especially in summer rape. Neither trifluralin nor nitralin residues were found in rape seeds.

See also 75-3019 75-3021 75-3118 75-3119

75-2994. Hrich, V. (CSR Ministry of Health, Prague, Czechoslovakia). **Ochrana zdravi lidi pri aplicaci pesticidu. [Protection of human health during application of pesticides.]** *Agrochemia (Bratislava)* 15(7): 215-216; 1975. (Czech)

Criteria used to determine health protection measures required against toxic effects of pesticides on the general population and on farm workers are summarized. The general population is protected by limiting or prohibiting the use of pesticides, based on an evaluation of the toxicological risk of their residues, the rise in resistance of target organisms, and the criterion of acceptable daily intake, established by WHO and FAO. The farm population protection is based on limiting the handling of pesticides to a small group of trained personnel. The criterion applied for precautionary measures is the LD50 (median lethal dose in rat). Dangerous pesticides administered orally have LD50's of less than 50 mg/kg for solids and less than 200 mg/kg for liquids. Danger levels for dermal application are less than 100 mg/kg for solids and less than 400 mg/kg for liquids. Safe levels are generally one to two orders of magnitude higher. Labels on each pesticide container should also include a description of the symptoms of acute poisoning, first aid measures to be administered by lay personnel, and required protective measures during handling, including personal hygiene.

75-2995. Maini, R. (Bioengineering Dep., Univ. Strathclyde, Glasgow, Scotland). **Removal of paraquat from blood by haemoperfusion over sorbent materials.** *Br. Med. J.* 3(5978): 281-282; 1975. (5 references)

The effects of hemoperfusion over activated charcoal or cation exchange resin on plasma paraquat concentrations were studied, since the toxic effects of paraquat seemingly result from selective accumulation of paraquat from blood into lung. One liter of heparinized bovine blood containing 7.8 μmol/l (2 mg/l) total paraquat was continuously recirculated at 200 ml/min from a reservoir at 37°C through a 250-ml polypropylene column containing either activated charcoal or cation exchange resin. Paraquat concentrations were determined in these in vitro experiments from radioactivity measurements. Both sorbents were totally effective within 1 hr. In vivo studies were performed using 9 male beagles, anesthetized and injected i.v with 29 μmol/kg (7.5 mg/kg) total paraquat. After 2 hr, three were treated with cation exchange resin while three served as untreated controls. Anticoagulation was achieved with heparin, and blood flow was maintained at 200 ml/min throughout hemoperfusion, 2 hr. Both forms of hemoperfusion significantly reduced plasma paraquat levels compared with controls. Cation exchange resin was more effective than activated charcoal. After hemoperfusion plasma paraquat concentrations increased in both treated groups. Paraquat concentrations approached control levels 30 min after charcoal hemoperfusion but took 90 min after cation exchange hemoperfusion. Activated charcoal reduced blood platelet concentration by 40% and cation exchange resin reduced them by 50%. A treatment is proposed for handling paraquat poisonings by combining the hemoperfusion method described here with forced diuresis and repeated administration of oral sorbents. The platelet falls seen are acceptable. The rebound in plasma paraquat concentration after hemoperfusion may be due in part to the method of paraquat administration, but may also indicate a necessity for prolonged hemoperfusion, especially when renal excretion is impaired by concomitant acute renal failure.

75-2996. Archer, T. E. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616). **Removal of 2,4-dichlorophenoxyacetic acid (2,4-D) formulations from noncombustible pesticide containers.** *Bull. Environ. Contam. Toxicol.* 13(1): 44-51; 1975. (7 references)

Methods were determined for the removal of formulations of 2,4-D in water miscible and paraffinic solvent bases from 5, 30, and 55 gal metal drums. The retention volumes of 2,4-D averaged 0.12% of the container volume for the 5-gal drums and 0.05-0.07% for the 35 and 55 gal drums. An initial high removal efficiency was achieved by water washing, the remaining 2,4-D being removed by ethanol-acid or ethanol washings. Washing the containers with eight water washings followed by three ethanol-acid or ethanol washings removed 95-99% of the retained formulations. Four water washings followed by three ethanol washings removed 96% of the 83.6 g (2,4-D acid equivalent) of the propylene glycol butyl ether ester formulation of 2,4-D retained within a 55 gal drum. Considering the low mammalian toxicity of 2,4-D, this probably represents adequate removal efficiency, and the recommended procedure is both convenient and economical.

75-2997. Hausen, B. M.; Schulz, K. H. (Dept. Allergology, Univ. Clin. Dermatol., Hamburg, West Germany). **Chrysanthemen-Allergie. 1. Mitteilung. [Chrysanthemum allergy. Part 1.]** *Berufs-Dermatosen* 21(5): 199-214; 1973. (93 references) (German)

Studies and observations on chrysanthemum allergy, most common among florists and gardeners handling *Chr. indicum* L., are reviewed. Certain sesquiterpene lactones of the guaianolide type, especially parthenolide, were found to be chiefly responsible for the allergy. Parthenolide had already been isolated from simple chrysanthemums but not from *Chr. indicum* L. The insecticidally active constitutents, such as pyrethrins, resmethrin, and bioresmethrin, were found not to be allergenic, although other components of the chryanthemums containing these are. Resmethrin and bioresmethrin are considered equivalents of DDT and capable of replacing it.

75-2998. Anonymous. **Pesticides and birds.** *Chemistry* 48(8): 20; 1975.

Wild birds began laying eggs with abnormally thin shells in the mid-1940's. Thinning occurred to an average degree of 12% in almost all birds of prey and in some cases

reached up to 20-30%. The degree of thinning was directly proportional to the chlorinated hydrocarbon content in the eggs of at least 25 species. This was especially true of the long lived metabolite of DDT, *p,p'*-DDE, whose effect can continue for a year or more after exposure. DDT itself and the PCBs have little apparent effect in this regard. Not only are thinner eggs more likely to crack before hatching, but the DDE-containing shells are less porous, thus reducing oxygen supply to the embryo. DDE is also toxic to the unhatched chick, and causes abnormal behavior in some of those which do hatch. It has also caused abnormal parental behavior. In addition to DDE, the decrease in thickness of egg shells is also directly related to dieldrin.

75-2999. Bull, D. L. (Cotton Insects Res. Lab., ARS, USDA, College Station, TX 77840). **Fate of methomyl on cotton.** *Environ. Entomol.* 3(4): 723-724; 1974. (9 references)

The fate of methomyl was studied after foliar application to cotton. Samples of 1-^{14}C-labeled methomyl in the form of technical (5.3 μCi/mg) or 5% dust (7.5μg ^{14}C-labeled methomyl/mg dust) preparations were used in the foliar treatments made *in situ* on fully-expanded leaves during July and August. Studies of absorption and metabolism were made with technical material spread uniformly over the surface of each leaf. Studies of absorption only used the radioactive dust formulation, 25 mg, spread over each leaf with a spatula. With the aqueous solutions of technical material, almost half the applied dose penetrated the leaf during the first few hours. Surface residues were essentially depleted after 48 hr, and methomyl was the only radioactive component of the unabsorbed dose. After the 8 day study, about 90% of the original dose could not be accounted for, probably reflecting both volatility loss from the leaf surface and translocation of absorbed radioactivity to other parts of the plant. Very little of the radioactivity in dust formulations penetrated the leaf surface, and the unabsorbed residues wre relatively persistent. These results are fairly consistent with results of earlier tests using tobacco, corn, and cabbage. No evidence was found of the potentially toxic *S*-oxide or *S,S*-dioxide derivatives. Instead the ^{14}C-labeled methomyl was degraded in plants to ^{14}C-labeled CO_2 and acetonitrile. The half life of the absorbed methomyl in cotton was 2-4 days. Foliar treatments of cotton with spray formulations of methomyl usually cause phytotoxicity, but this undesirable effect is mimimized by using dust formulations. Differences in penetration probably explain this difference in the response of the plants to the 2 different methods of application.

75-3000. Arena, J. M. (Dep. Pediatr. and Poison Control Cent, Duke Univ. Med. Cent., Durham, NC). **Poisoning—general treatment and prevention. Part II.** *J. Am. Med. Assoc.* 233(4): 358-363; 1975.

The prophylactic administration of antibiotics, often of value in treating inflammatory conditions which follow the ingestion of certain toxic substances, is not looked on with favor by some physicians in the field. Hemodialysis can be useful in cases of severe poisoning by dialyzable substances as well as by nondialyzable nephrotoxic compounds that produce acute tubular damage and renal failure. Lipid dialysis, a recently developed technique, is useful in treating poisoning by lipid-soluble substances. Peritoneal dialysis is effective for ridding the body of overdoses of many exogenous poisons. Exchange transfusion and forced diuresis are also discussed. Establishing respiratory exchange is most important. Central nervous system stimulants must not be used to improve respiration in the absence of other treatment. The patient should be positioned with the legs generally elevated to the level of the right auricle to allow venous drainage of the lower extremities. Intravenously administered vasopressors may be required. In acute poisoning, direct myocardial damage may cause rapid heart failure. The adminstration of adequate amounts of fluid is important therapy in all cases, especially if the poison is excreted in the urine. Specific antidotes are available for organophosphates, heavy metals, thallium, sodium fluoroacetate, and other compounds.

75-3001. Wolff, F. (Bezirksinspektion Gesundheitsschutz Betrieben Neubrandenburg, Neubrandenburg, DDR). **Probleme und Aufgaben des Arbeitsschutzes bei der Anwendung von Pflanzenschutzmitteln. [Problems and tasks regarding industrial safety during application of plant protectives.]** *Nachrichtenbl. Pflanzenschutzd. DDR* 29(6): 126-128; 1975. (2 references) (German)

Problems and tasks regarding industrial safety during application of agricultural pesticides are discussed and agricultural accident statistics for Neubrandenburg county, East Germany, are presented. While occupational accidents due to agricultural chemicals accounted for only a small percentage of all occupational accidents, their number is tending to rise. Occupational poisonings with pesticides were recorded in 32 cases during the 1957-1973 period of Neubrandenburg county. The causative agents were organophosphorus pesticides in 9 cases, hydrogen phosphide in 7 cases, organomercurial seed-dressing preparations in 2 cases (one fatal), DNOC in 9 cases, DDT plus BHC in 5 cases, hydrogen sulfide in one (fatal) case, and carbon monoxide in 3 cases, one of them fatal. During the same period, herbicides were responsible for 16 cases of occupational allergic contact eczema out of a total of 156 cases. The use of protective clothing and respirators and the need for yearly medical checkups are emphasized.

75-3002. Miller, R. W. (Epidemiol. Br., Natl. Cancer Inst., Bethesda, MD). **How environmental effects on child health are recognized.** *Pediatrics* 53(5): 792-799; 1974. (35 references)

Various epidemiological studies are cited which link damage in children to exposure to environmental pollutants before their birth. Children of women with Minamata

disease, caused by pollution of water with methylmercury, had an increased incidence of cerebral palsy. An epidemic of chloracne occurred among children and adults exposed to polychlorinated biphenyls, and chloracne was also noted among the offspring of 10 women pregnant at the time of exposure. The use of prospective studies may refine relationships in which cohorts of exposed versus lightly exposed or nonexposed children are followed over time to define the frequency of subsequent disease in relation to a wide dose range of the agent in question. This method will also reveal subtle manifestations of the disease induced and, with respect to intrauterine exposures, the interval of maximum susceptibility. Demonstrating an association between an environmental exposure and increased frequency of a specific disease is not sufficient. Whether the association is causal must be established. The use of epidemiology in the areas of descriptive studies, analytical studies, surveillance, value of registries, practitioner reporting systems, and record linkage through computer information systems has enabled much data to be gathered in this field.

75-3003. Everall, J. (Skin Dep., Royal Arsden Hosp., London, England). **Occupational cancer in skin carcinogenesis.** *Proc. Int. Cancer Congr.* 11 (Part 3): 91-93; 1974. (4 references)

Occupational exposure to arsenical insecticides can result in cancer. The carcinogenic effects of arsenic probably come about in the main by ingestion or inhalation. Arsenical cancer can occur at any site on the skin, either presenting as squamous cell carcinoma or less commonly as basal cell carcinoma. These tumors often present as intra-epidermal carcinomas, as in Bowen's disease. It is estimated that about one third of the patients will in time develop multicentric carcinomas involving the lungs or gastrointestinal tract. Polycyclic hydrocarbons are also proven carcinogens.

75-3004. Davies, D. S.; Conolly, M. E. (Royal Postgrad. Med. Sch., London, W12 OHS, England). **Paraquat poisoning - possible therapeutic approach.** *Proc. R. Soc. Med.* 68(7): 22; 1975. (3 references)

The first line of treatment in cases of paraquat poisoning is to prevent further absorption of the poison. Gastric lavage should be performed, followed by copious doses of fuller's earth, which adsorbs paraquat. If the renal function is normal, passage of paraquat through the kidneys is rapid. Use of diuretics does not seem to increase this passage and indeed is dangerous in any case of ingestion of a poison which can cause pulmonary edema. Hemodialysis may be of value in cases of large doses of poison ingested where the renal function is inadequate. The use of superoxide dismutase is suggested; it should be given both i.v. and by nebulized aerosol. Apart from troublesome thrombophlebitis at the site of infusion, no untoward reactions have been observed when it is given for periods up to one month. Two other drugs, beclomethasone and D-propranolol, are recommended. Beclomethasone is given to reduce inflammatory reaction in the lung. D-propranolol was given in the hope it would displace paraquat from the lungs. This desired effect did not occur, but the drug may be able to prevent paraquat from entering lung tissue.

75-3005. Pariente, R.; Bismuth, C.; Legrand, M.; Gauthier, M. (Dep. Pneumol. Reanimation, Antoine-Beclere Hosp., Clamart, France). **Donnees apportees par l'etude ultrastructurale dans deux intoxications humaines par le paraquat.** [**Data provided by ultrastructural study in two cases of paraquat poisoning in man.**] *Rev. Fr. Malad. Resp.* 2(11): 968-977; 1974. (9 references) (French)

Histological and cytological findings in two fatal cases of paraquat poisoning are presented. Both patients died from irreversible respiratory insufficiency. Rarefaction of the capillaries, alterations of endothelial cells, hyperplasia and edema of the interstitium, alteration of type I pneumocytes, hemorrhagic zones inside the alveoli, and relatively slight lesions of granular pneumocytes were observed. The nonspecific acute interstitital pneumopathy of uncertain physiopathology which develops after acute tubular nephritis is due to the increased capillary permeability under the influence of paraquat. The capillary permeability is further increased by the surfactant deficiency.

75-3006. Jurek, A. (Dep. Sanit. Toxicol., State Dep. Hyg., Warsaw, Poland). **Rakotworczosc pestycydow.** [**Carcinogenicity of pesticides.**] *Roczn. Panstw. Zakl. Hig.* 25(5): 563-576; 1974. (12 references) (Polish)

The findings and recommendations of the U.S. Commission on Pesticides and their Relationship to Environmental Health form the basis for a review of various aspects of carcinogenicity testing. Biological testing guidelines (for number, strain, and sex of animals, length of observation, classification of resulting tumors, exact data on administered compounds) are discussed and the results interpreted. Pesticides have been classified, by degree of carcinogenic effect, into several groups. Group A (chlorpropham, rotenone, carbaryl) are "nonpositive" in two animal species and registered for use on agricultural crops. Group B consists of aldrin, aramite, chlorobenzilate, DDT, dieldrin, mirex, strobane, heptachlor amitrole, di-allate, bis(2-chloroethyl) ether, *N*-(2-hydroxyethyl) hydrazine, and PCNB (these are not used on agricultural crops). This group gave positive results on one or more animal species at the 0.01 significance level. Group C (pesticides with insufficient data for definite evaluation) is subdivided according to the necessity for further research. Group C_1 includes *p,p'*-DDD, monuron, perthane, piperonyl butoxide, and piperonyl sulfoxide, and compounds not used for agricultural crops, i.e., azobenzene, chlormequat chloride, chloranil, cyanamide, vacide BL, and mexacarbate. The C_2 group consists of biphenyl, captan, dichloran, captax, giberellic acid, and ovex; and genite-R99 and propham (not used in agriculture). In group

C_3 are: dichlorprop, 2,4-D isopropyl ester, propyl isome, pyrethrins, and zineb; those not used in agriculture are α-naphthylacetamide and 2(2,4,5-trichlorophenoxy)propionic acid. Group C_4 covers atrazine, botran, butacide, 2,4-D, dichlone, diuron, *o*-phenylphenol, endosulfan, ferbam, folpet, glyodin, maneb, methoxychlor, ziram, nabam, phenothiazine, Planofix NAA, propazine, simazine, tetradifon, thiram, eptam, the butyl and iso-octylesters of 2,4-D, anhydrous acetic acid, and maleic hydrazide.

75-3007. Bick, J. (British Wood Preserving Assoc., London, England). **Toxicity of preserved timber.** *Vet. Rec.* 96(8): 187-188; 1975. (2 references)

The possible toxicity of timber treated with wood preservatives of the copper/chrome/arsenate type is briefly discussed in a letter-to-the-editor. Although these preservatives are toxic in the liquid state, when they are allowed to impregnate the wood and dry, they react with the wood and with each other, producing an insoluble complex which is extremely resistant to leaching. Thus they are of very low hazard to animals in contact with the treated wood. One study has shown that, especially in cases of bovines and ovines, the amount of treated wood ingested would have to be of the order of more than 1 oz/day for at least one month before symptoms of chronic poisoning were noted. As the heavy metals can all be determined readily and easily, it is suggested that chemical confirmation always be carried out in any case of suspected poisoning from the use of these preservatives.

See also 75-2933 75-3053 75-3061 75-3067 75-3097 75-3118 75-3119

75-3008. Yamane, S.; Kino, A.; Teshima, S. I. (Fac. Agric., Miyazaki Univ., Miyazaki, Japan). **Histochemical demonstration of cholinesterase activity in tissues of the carp and effect of DDVP on its activity in situ.** *Acta Histochem. Cytochem.* 7(2): 167-175; 1974. (17 references)

Histological examinations of the carp, *Cyprinus carpio*, were carried out to determine the cholinesterase activity of the optic lobe, cerebellum, medulla oblongata, retina, intestine, liver, kidney, heart, and body muscles in response to treatment with *O,O*-dimethyl-2,2-dichlorovinyl phosphate (DDVP, dichlorvos). The studies were performed after sublethal exposure of the fish to DDVP (25 ppm) for about 45 min. DDVP exposure abolished cholinesterase activity in the stratum griseum periventriculare, sarcolemma, and liver. The exposure abated the enzyme activity in all other tissues studied. The results of this study suggest that the interference of DDVP with efferent neurons occurs because of their cholinergic character. The drastic reduction in such layers and parts as found in this study may be closely related to the movement of the fish examined, that is, extreme flexion of the body to one side with spastic convulsions and loss of equilibrium after DDVP exposure.

75-3009. Balicka, N.; Kosinkiewicz, B.; Stankiewicz, M. (Agric. Univ., Wroclaw, Poland). **Biological deactivation of Rg seed dressing in soil.** *Acta Microbiol. Pol.* (B) 6(23): 93-95; 1974. (8 references)

The deactivation of Rg seed dressing (containing phenylmercuric acetate) by *Arthrobacter* sp 2b was studied in soil. Effects of other soil microorganisms were also investigated. The number of living cells in the culture media decreased after Rg treatment from 10^{11} to 10^{2}. As the extent of Rg deactivation by living and dead cells is almost the same, the toxic effect of Rg on cells was ignored. Cells of *Pseudomonas* sp. 11, *Micrococcus* sp. 32 and unidentified strain 1c reduced the Rg toxicity to various degrees, depending on the age of the culture and the number of cells. *Actinomyces griseus* detoxicated the Rg less than the bacteria. The culture of *Rhodotorula glutinis* 21a containing 17 to 18 mg dry weight/50 ml caused complete deactivation of 50 ppm Rg. The supernatant of this culture was the only one which decreased the Rg toxicity. It was suggested this may be due to cysteine. The detoxication of Rg in soil was increased considerably after the suspension of *Arthrobacter* sp. 2b was introduced into it. The width of the inhibition zone of *Fusarium* was 3 times smaller than was caused by the blank containing Rg alone. Supernatant of the *Arthrobacter* culture did not deactivate the Rg in the soil. Deactivation of Rg in control soil was much lower. Different sorption capacity of both soils used had no significant effect on the deactivation process. The introduction of Rg into soil directly or on the beet-seeds had no effect on the rate of pesticide deactivation.

75-3010. Gupta, P. K. (Ind. Toxicol. Res. Cent., Lucknow, India). **Malathion induced biochemical changes in rats.** *Acta Pharmacol. Toxicol.* 35(3): 191-194; 1974. (8 references)

The effects of malathion were studied on blood sugar, glycogen content in different tissues, and plasma electrolytes of rats after a single i.p. dose. Female albino rats were injected i.p. with malathion in propylene glycol at the rate of 50 mg/100 g body weight. Within 30 min the blood glucose levels were considerably greater than controls. The maximum increase of blood glucose was noted at 2 hr and thereafter the values remained appreciably high up to 6 hr after treatment. Plasma sodium showed a gradual increase and the maximum increase occurred at 6 hr. Afterwards the values returned to almost control levels. There was no significant change in plasma potassium. The glycogen levels of the liver, kidney, heart, spleen, and brain of controls were respectively 70, 6, 8, 12, and 4 mg/100 g. In general, 6 to 24 hr after malathion treatment the glycogen content of these tissues was considerably increased, reaching a maximum increase at about 12 hr. This increase was more marked in the liver than in any other tissue. There was no increase in the glycogen of brain tissue. It is suggested that the hyperglycemia induced by malathion may be partly explained by inhibition of cholinesterase at neuroeffector sites in the adrenal medulla leading to hypersecretion of adrenaline which stimulated the breakdown of glycogen to glucose. Thus, cholinergic inhibitors also exert secondary adrenergic reactions. The mechanism for the increase in plasma sodium may relate to the influence of some hormonal mechanism in response to stress, possibly through the stimulation of aldosterone secretion. However, it is also true that the predominant effect of anticholinesterase agents on the cardiovascular system is to reduce cardiac output as a result of bradycardia and negative inotropic effects. The decreased cardiac output in turn stimulates the secretion of aldosterone. The increased glycogen deposition during 6 to 24 hr after malathion treatment may be due to clearance of lactic acid and glucose from the blood and the synthesis of these precursors into glycogen mainly in the liver and to some extent in other tissues.

75-3011. Ueyama, I.; Takase, I. (Agric. Chem. Inst., Nippon Tokushu Noyaku Seizo Co. Ltd., Hino, Tokyo, Japan). **Metabolic behavior of *O*-ethyl *S,S*-diphenyl phosphorodithiolate (edifenphos) in female goat.** *Agric. Biol. Chem. (Tokyo)* 39(9): 1719-1727; 1975. (16 references)

Gas-liquid chromatographic techniques are used to determine residues in fresh milk and the metabolic fate of edifenphos (*O*-ethyl *S,S*-diphenyl phosphorodithiolate), active ingredient of fungicide hinosan, in female goats. Edifenphos rapidly metabolizes to form polar products which are excreted in urine. Found in the urine are the major metabolites *O*-ethyl *S*-phenyl hydrogen phosphorothioate and *O*-conjugates of *m*- and *p*-(hydroxyphenyl) methyl sulfone. Other metabolites identified are *S,S*-diphenyl hydrogen phosphorodithiolate, *S*-phenyl hydrogen phosphorodithiolate, and methyl phenyl sulfone. Minimal amounts of edifenphos are found

in the feces, blood, and some organs and tissues. Oral edifenphos administration to goats (10 mg/kg) results in the secretion of 0.0008 ppm edifenphos in milk, the maximum level after 6 hr of the administration.

75-3012. El-Sadek, L. M. (Botany Dep., Fac. Sci., Alexandria Univ., Alexandria, Egypt). **Comparison of cytogenetic activity of compounds on molar basis.** *Alexandria J. Agric. Res.* 20(2): 283-288; 1972. (10 references)

A study was made of common methods of expressing concentrations of chemicals investigated for their mutagenicity or ability to induce chromosomal aberrations. In the course of this study, samples of data from several studies calculated on the basis of ppm or percentage were reconsidered on the basis of molar concentration. It was concluded that comparison of the mutational responses to chemicals in relation to the dose applied is inaccurate if concentration is expressed as parts per million or as a percentage of the active agent in the solution used. The rate of a physical or chemical change is dependent on the molar concentrations of the reactants, and therefore the activity of a compound should be assessed in terms of the molar concentration in the biological system. The effectiveness of chemical compounds is governed by the number of molecules in solution, the duration of treatment, and the temperature, assuming that no appreciable decomposition of compounds occurs during treatment. Therefore the lower effectiveness of a low molecular concentration applied for a short time would be compensated by a long treatment duration at a fixed temperature.

75-3013. Schricker, B. (Author address not given). **Der Einfluss subletaler Dosen von E 605 auf das Mitteilungsvermoegen von Sammelbienen. [Effect of sublethal doses of E 605 on the communicative ability of assembling bees.]** *Allg. Dtsch. Imkerztg.* 7(10): 258-261; 1973. (German)

The effect of sublethal doses of E 605 on the communicative ability of assembling bees was studied. The pesticide was added to the sugar solution fed to the bees. The actual sublethal dose was found to be less than 0.03 μg. After bees were trained to a new feeding place, some of them were locked in and some were poisoned at the feeding place. The poisoned bees, returning to the hives, performed dances which gave false information to the others as to the direction and distance of the new feeding place. The actual distance was consistently and significantly greater than was indicated by the dances, and the direction given was false because it was not related to the actual position of the sun. All poisoned bees showed the way correctly on the following day.

75-3014. Silvestri, R.; Himes, J. A.; Edds, G. T. (Dep. Vet. Sci., Univ. Florida, Gainesville, FL 32611). **Repeated oral administration of coumaphos in sheep: effects on erythrocyte acetylcholinesterase and other constituents.** *Am. J. Vet. Res.* 36(3): 283-287; 1975. (22 references)

The effects of coumaphos, 2 or 4 mg/kg given once a day for 6 days, were studied on adult wethers. A gradual decrease of erythrocyte acetylcholinesterase activity was noted after treatment with the smaller dose, but this was not accompanied by signs of toxicosis. The larger dose appeared toxic. A second treatment made 6 weeks later did not seem to alter significantly the anticholinesterase effects. Serum activities of aspartate aminotransferase (glutamic oxalacetic transaminase) or isocitrate dehydrogenase and concentrations of serum sodium and plasma calcium were not altered by coumaphos treatment. A marked decrease in blood serum potassium and an increase in plasma magnesium occurred in all wethers that died after treatment with coumaphos. In survivors of the second treatment with coumaphos, a decrease in serum potassium was also noted, whereas appreciable changes did not occur in survivors of the treatment given 6 weeks earlier. When sheep were given an i.v. injection of the organophosphorus compound trichlorfon, in a dose insufficient to produce a significant effect on erythrocyte cholinesterase activity, an additive effect was noted with the effects of coumaphos. In conclusion, treatment with 6 daily doses of 2 mg of coumaphos/kg appears safe for adult wethers, whereas daily doses of 4 mg/kg approach toxicity and lethality. Thus the margin of safety for coumaphos is relatively narrow. It is suggested this margin would be further reduced in debilitated animals. The problem becomes apparent when the compound is used in the form of a drench or added to feed, for the dosage in these situations cannot be tightly controlled. It is suggested that the safety of doses of coumaphos less than 2 mg/kg/day be evaluated in sheep.

75-3015. Silvestri, R.; Himes, J. A.; Edds, G. T. (Dep. Vet. Sci., Univ. Florida, Gainesville, FL 32611). **Repeated oral administration of coumaphos in sheep: interactions of coumaphos with bishydroxycoumarin, trichlorfon, and phenobarbital sodium.** *Am. J. Vet. Res.* 36(3): 289-292; 1975. (20 references)

Interactions of coumaphos treatments with bishydroxycoumarin, trichlorfon, and phenobarbital sodium were investigated in sheep. Neither plasma enzymes nor the antiprothrombinemic effect of bishydroxycoumarin in wethers was affected by a daily dose of 2 mg coumaphos/kg for 6 days. Given to ewes i.v. in a dose insufficient to produce significant inhibition of erythrocyte acetylcholinesterase activity, trichlorfon produced additive effects with subsequent treatment with 4 mg coumaphos/kg/day. Phenobarbital sodium (40 mg/kg for 5 days, i.p.) given to ewes significantly reduced the anticholinesterase effect of 4 mg coumaphos/kg. Signs of toxicity were not seen. Coumaphos given in daily doses of 2 mg/kg for 6 days did not modify anticholinesterase effects of a second series of treatments given 6 weeks later. It is clearly indicated that pretreatment with phenobarbital significantly reduced the anticholinesterase effect of coumaphos and prevented the appearance of signs of toxicosis.

75-3016. Bellows, R. A.; Rumsey, T. S.; Kasson, C. W.; Bond, J.; Warwick, E. J.; Pahnish, O. F. (U.S. Range Livestock Exp. Stn., Miles City, MT 59301). **Effects of organic phosphate systemic insecticides on bovine embryonic survival and development.** *Am. J. Vet. Res.* 36(8): 1133-1140; 1975. (25 references)

The effects of 2 organic phosphate systemic insecticides on embryonic survival and possible teratogenesis in cattle were studied. Crufomate or coumaphos were applied to a total of 726 heifers. Crufomate compound solutions were applied at the rate of 28.5 g/45.4 kg with the maximal dosage not to exceed 228 g. The coumaphos compound was appled to heifers at the rate of 14.2 g or 28.5 g/45.4 kg. The compounds were administered in various stages of gestation by pouring along the dorsal midline. Treatments were given at the recommended one-time doses, one-time doses at double or triple the recommended dose levels, or doses at recommended one-time dose levels repeated each day for 10 days. None of these treatments gave evidence of increasing embryonic death rates or of teratogenic effects. The crufomate compound had apparent erratic effects in one experiment on serum acetylcholinesterase activities, but no effects were noted on electrocardiographic patterns, heart rate, or respiration rate. One calf born during these studies was malformed, but it is felt this may have been caused by rectal palpation for pregnancy determination during the 35 to 44 day stage of pregnancy.

75-3017. Stefan, A.; Stancioiu, N.; Ceausescu, S. (Author address not given). **Modificari ale unor constante sanguine la sobolani intoxicati cu Vitavax. [Histochemical modifications of certain blood components in white rats poisoned by vitavax.]** *An. Univ. Bucuresti Biol. Anim.* 22: 125-130: 1973. (13 references) (Rumanian)

The effect of vitavax on certain blood components was studied in male Wistar rats that were fed 0.015 mg vitavax in their diet daily for 30 or 45 days. Nervous disturbances and weight loss were observed in the experimental animals. The erythrocyte count dropped to 2,500,000 from 7,300,000 per mm^3, and the Hb level fell from 15.28 g% to 12.4 g%. The leukocyte count increased twofold, reflecting the role of these cells in defense against poisoning. The globulin fraction increased from 44.95±0.15 to 59.9±0.18%, while the albumin fraction decreased from 55.05±0.25 to 40.1±0.4%. Vitavax was found to inhibit the GOT activity, and to stimulate the GPT and alkaline phosphatase activities.

75-3018. Munnecke, D. M.; Hsieh, D. P. H. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616). **Microbial metabolism of a parathion-xylene pesticide formulation.** *Appl. Microbiol.* 30(4): 575-580; 1975. (16 references)

A mixed bacterial culture was adapted to growth on a mirex carbon substrate consisting of the pesticide parathion and its xylene-based formulation. The environmental growth parameters of temperature, pH, and dissolved oxygen concentration were optimized to obtain complete metabolism of parathion from this mixed carbon substrate. This adapted culture grew rapidly (μ = 0.7 per h) on the pesticide formulation at high parathion suspensions (3,000 mg/liter). Carbon utilization from this mixed substrate was strongly dependent on pH. At slightly acidic pH, xylene was preferentially metabolized, whereas at slightly alkaline pH, parathion was preferentially metabolized. Diethylthiophosphoric acid, a metabolite from parathion, and toluic acid, a metabolite from xylene, also influenced the selection of the primary carbon source. (Author abstract by permission)

75-3019. Wolfe, H. R.; Armstrong, J. F.; Staiff, D. C.; Comer, S. W.; Durham, W. F. (Environ. Protect. Agency, Natl. Environ. Res. Cent., Pestic. Toxic Substances Effects Lab., Field Stud. Sect., Wenatchee, WA 98801). **Exposure of apple thinners to parathion residues.** *Arch. Environ. Contam. Toxicol.* 3(3): 257-267; 1975. (10 references)

In studies of potential exposure of a volunteer working under controlled conditions during apple hand-thinning operations at 1, 24, 48, 72, 96, 168, and 240 hr after application of conventional 0.03% parathion spray, both dermal and respiratory exposure values were greater where water-wettable powder formulations were used than where emulsifiables were used. Residue levels of parathion on leaves from the two types of application were about the same. Only trace amounts of paraoxon could be detected at one and seven days after application. Highest exposure values (14.2 mg/hr dermally and 0.15 mg/hr respiratorily) were obtained within 24 hr of application. Exposure was considerably less after residues were 72 hr old. Greatest exposure was on the forearms and hands. Urinary *p*-nitrophenol excretion indicated slightly more absorption following exposure in water-wettable powder experimental plots. Potential exposure values indicate that absorption could reach hazardous levels after one or two hr of work, even at the 96-hr residue period, if all the pesticide were absorbed. Considering that only a small fraction of the total amount would be absorbed, it is calculated that at 72-hr residue period poisoning should not occur. There was no significant change in blood cholinesterase activity of the volunteer worker. Variation in spray deposit within an orchard due to poor tank mixing did not appear to be great enough to be considered an important factor affecting exposure. (Author abstract by permission)

75-3020. Jordon, L. S.; Zurqiyah, A. A.; Clerx, W. A.; Leasch, J. G. (Dep. Plant Sci., Univ. California, Riverside, CA 92502). **Metabolism of terbacil in orange seedlings.** *Arch. Environ. Contam. Toxicol.* 3(3): 268-277; 1975. (9 references)

Orange seedlings were cultured in aqueous solutions of 3-*tert*-butyl-5-chloro-6-methyluracil (terbacil and terbacil-2-^{14}C). Radioactivity was distributed throughout the plant with the largest amount in the roots and the

smallest amount in the leaves. Terbacil was metabolized to form 3-*tert*-butyl-5-chloro-6-hydroxymethyl uracil, which was conjugated to form a β-glucoside as the conjugate was hydrolyzed by β-glucosidase. Identification of the metabolite was made by infrared and mass spectrometry after isolation and purification by column and thin layer chromatography. An additional unidentified water-soluble material was accumulated in the plant. 5-chloro-uracil was not detected as a metabolite of terbacil; (Author abstract by permission)

75-3021. Ware, G. W.; Morgan, D. P.; Estesen, B. J.; Cahill, W. P. (Dep. Entomol., Univ. Arizona, Tucson, AZ 85721). **Establishment of reentry intervals for organophosphate-treated cotton fields based on human data: III. 12 To 72 hours post-treatment exposure to monocrotophos, ethyl- and methyl parathion.** *Arch. Environ. Contam. Toxicol.* 3(3): 289-306; 1975. (15 references)

Five human volunteers entered methyl parathion, ethyl parathion, or monocrotophos treated cotton fields for five-hr exposure periods when the residues of the respective pesticides had aged 12 hr, 24 and 48 hr, and 48 and 72 hr. Foliage residues of methyl parathion disappeared fastest; those of monocrotophos slowest. Personal exposure to pesticide was evaluated from contamination of skin, clothing, and ambient air, while actual absorption of chemical was assessed from pesticide concentration in blood, urinary metabolite excretion, and effects on blood cholinesterase activities. There was good correspondence between magnitudes of foliar residue, estimates of personal contamination, and measures of chemical absorption. Field exposures caused no symptoms or clinical signs of organophosphate poisoning and depressed averaged blood cholinesterase activities by no more than 14% of pre-exposure levels. (Author abstract by permission)

75-3022. Greichus, Y. A.; Call, D. J.; Ammann, B. M. (Entomol.-Zool. Dep., South Dakota State Univ., Brookings, SD 57007). **Physiological effects of polychlorinated biphenyls or a combination of DDT, DDD, and DDE in penned white pelicans.** *Arch. Environ. Contam. Toxicol.* 3(3): 330-343; 1975. (35 references)

The effects of PCBs (polychlorinated biphenyls) or a combination of DDT (1,1,1-trichloro-2,2-bis (*p*-chlorophenyl) ethane), DDD (1,1-dichloro-2,2-bis (*p*-chlorophenyl) ethane), and DDE (1,1-dichloro,2,-bis (*p*-chlorophenyl ethylene) on organ weights, liver storage of vitamin A and carotene, selected blood chemistry parameters, and serum protein fractions were determined in penned white pelicans (*Pelecanus erythrochynchos*) receiving a daily dosage of these compounds. Birds received 100 mg of PCBs or a combination of DDT (20 mg), DDD (15 mg), and DDE (15 mg) injected into the first fish fed each day for ten weeks. A greater percentage of PCB treatment was retained in brain, liver, carcass, and feathers than the percentage of DDT-DDD-DDE treatment. Liver weight as percent of body weight decreased ($p < 0.01$) in DDT-DDD-DDE-treated birds and increased ($p < 0.01$) as a total weight in PCB-treated birds. Spleen weight as percent of body weight was greater ($p < 0.05$) in PCB-treated birds. Neither treatment had a significant effect on the weight of the brain, heart, or kidney. Liver vitamin A levels were greater ($p < 0.01$) on a μg/g of liver basis in the DDT-treated birds than in controls. Significant lowering of serum potassium and protein values was noted in both the PCB-and the combination of DDT, DDD, DDE-treated birds, while serum calcium values were lowered ($p < 0.01$) only in PCB-treated birds. Values of serum inorganic phosphorus, uric acid and magnesium were not significantly changed by either treatment. Globulin fractions were unaltered by either treatment, but albumin fractions were lowered ($p < 0.01$) in the PCB-treated pelicans. (Author abstract by permission)

75-3023. Steffens, W.; Wieneke, J. (Arbeitsgruppe Radioagron., Kernforschungsanlage, Julich, Germany). **Influence of humidity and rain on uptake and metabolism of ^{14}C-azinphos-methyl in bean plants.** *Arch. Environ. Contam. Toxicol.* 3(3): 364-370; 1975. (8 references)

In several experiments the influence of relative humidity and rain on uptake and metabolism of carbonyl-^{14}C-azinphos-methyl was examined in bean plants under the following environmental conditions: growth room with 35/80%, 65/85%, and 95/95% (day/night) relative humidity and open field with and without rain. Increasing relative humidity had an enhancing effect on the rate of uptake and metabolism. A higher portion of water-soluble compounds was found in the bean tissue, although the azinphos-methyl itself is relatively non-polar. Low relative humidity and possible dry periods in summer will reduce the uptake and will leave the azinphos-methyl relatively persistent on the leaf surface. Rain or spray irrigation easily removed azinphos-methyl from the leaves. The rate of this removal seemed to depend on the intensity and time of rainfall after application. However, repeated wettings by rain may simultaneously stimulate uptake and metabolism of azinphos-methyl by the leaves. (Author abstract by permission)

75-3024. Tagatz, M. E.; Borthwick, P. W.; Forester, J. (Environ. Protect. Agency, Gulf Breeze Environ. Res. Lab., Gulf Breeze, FL 32561). **Seasonal effects of leached mirex on selected estuarine animals.** *Arch. Environ. Contam. Toxicol.* 3(3): 371-383; 1975. (15 references)

Four 28-day seasonal experiments were conducted using selected estuarine animals in outdoor tanks that received continuous flow of mirex-laden water. Mirex (dodecachlorooctahydro -1,3,4- metheno-2*H*-cyclobuta [*cd*] pentalene) leached from fire ant bait (0.3% mirex) by fresh water and then mixed with salt was toxic to blue crabs (*Callinectes sapidus*), pink shrimp (*Penaeus duorarum*), and grass shrimp (*Palaemonetes pugio*) but not to sheepshead minnows (*Cyprinodon variegatus*) at concentrations less than 0.53 μg/l in water. The amount of leaching was greatest in summer and least in spring.

Greatest mortality occurred in summer at the highest water temperature and concentration of mirex; least mortality occurred in spring at next to the lowest temperature and at the least concentration. Earliest deaths of blue crabs occurred after six days of exposure and shrimp after two days. Small juvenile crabs were more sensitive to leached mirex than were large juveniles. Mirex did not appear to affect growth or frequency of molting in crabs. All exposed animals concentrated mirex. Among animals that survived for 28 days, sheepshead minnows concentrated mirex 40,800× above the concentration in the water, blue crabs 2,300×, pink shrimp 10,000×, and grass shrimp 10,000×. Sand substrata contained mirex up to 770× that in the water. Most control and exposed animals in samples examined histologically had normal tissues, but alteration in gills of some exposed fish and natural pathogens in some exposed and control crabs and shrimp were observed. The experiments demonstrated that mirex can be leached from bait by fresh water, concentrated by estuarine organisms, and can be toxic to crabs and shrimps. (Author abstract by permission)

75-3025. Nattermann, H.; Krueger, S.; Werner, E. (Section Animal Production and Vet. Med., Humboldt Univ., Berlin, DDR). **Untersuchungen ueber den Einfluss von Dimethyldichlorvinylphosphat auf die alkalische Phosphatase. [Action of dichlorvos on alkaline phosphatase.]** *Arch. Exper. Veterinaermed.* 28(3): 323-328; 1974. (11 references) (German)

The effect of dichlorvos (DDVP) on commerical alkaline phosphatase was studied in vitro at 37°C, using the photometric method developed by King and Armstrong as modified by Kirberger and Martini for the activity measurement. The DDVP concentrations used ranged from 0.95 μM to 0.45 pM/per ml. All concentrations caused a significant reduction of the alkaline phosphatase activity from 0.4 to 0.3 unit. The inhibition reached its peak value of 25% at 45 pM/ml concentration, while no further increase in concentration was able to decrease the enzyme activity to below 75% of the original value. Competitive inhibition of alkaline phosphatase was observed. The inhibition of alkaline phosphatase by DDVP may be interpreted as the basis of hypocalcemia. Clinical symptoms of DDVP poisoning can become manifest under the effect of stressor causing an increase in the epinephrine secretion.

75-3026. Modak, A. T.; Stavinoha, W. B.; Weintraub, S. T. (Dep. Pharmacol., Univ. Texas Health Sci. Cent. San Antonio, San Antonio, TX 78284). **Dichlorvos and the cholinergic system: effects on cholinesterase and acetylcholine and choline contents of rat tissues.** *Arch. Int. Pharmacodyn. Ther.* 217(2): 293-301; 1975. (27 references)

The inhibition of cholinesterase by 50 mg/kg/5 ml, p.o., dichlorvos and subsequent recovery of enzyme activity was uniform in all brain regions studied. This uniformity was not observed in liver, erythrocytes, and plasma. Acetylcholine levels were elevated in brain areas from 48 to 171% at 15 minutes after treatment. However, a biphasic effect was seen on choline metabolism in the brain. The cortex was found to be more cholinergic than the striatum in terms of per cent increase in acetylcholine and choline. (Author abstract by permission)

75-3027. Butler, C., II. (Dep. Pathol., Univ. Arizona Coll. Med., Tucson, AZ 85724). **Pulmonary interstitial fibrosis from paraquat in the hamster.** *Arch. Pathol.* 99(9): 503-507; 1975. (20 references)

A study was made to determine the usefulness of the paraquat-treated hamster as a model of interstitial inflammation of the lung. This study also explores the effects of both Freund adjuvant and adrenocorticotrophic hormone on paraquat-induced lung changes. Immature male Syrian hamsters were used for the study. All animals were injected in the dorsal s.c. tissue at a volume of 1 ml/kg. Sixteen animals were given paraquat alone, 24 received paraquat and ACTH, 24 received paraquat and complete Freund adjuvant,12 received ACTH alone,and 12 received only complete Freund adjuvant. Throughout the 8 week study, ACTH was given twice weekly; complete Freund adjuvant only once. The results indicate that the response of the hamster to paraquat is generally similar to that of the rat and man, with some striking differences. Chronic interstitial inflammation and fibrosis cannot be produced by a single injection, but require a prolonged series of multiple exposures. Hamsters that survived the entire series all lived for another month and then were sacrificed. In contrast, adequate doses in man and rats usually result in relentless progression of pulmonary lesions to death. Induced hypercorticism reduced the weight loss and was clearly an effective protection against the pulmonary effects of paraquat in hamsters. The results of the study allow the conclusion that hamsters are relatively resistant to the chronic pulmonary lesion at doses low enough for prolonged survival, although high doses produce fatal hemorrhagic pulmonary edema in a few days. Thus, this model has some drawbacks for the study of chronic interstitial fibrosis, particularly the early mortality and the variable extent of lesions, but it is very attractive as a model of relative resistance to exogenously induced interstitial injury. Both Freund adjuvant and ACTH diminished the pulmonary injury.

75-3028. Clark, J. M. (Sch. Biol. Sci., Flinders Univ. South Australia, Bedford Park, South Australia 5042). **Mutagenicity of DDT in mice, *Drosophila melanogaster* and *Neurospora crassa*.** *Aust. J. Biol. Sci.* 27(4): 427-440; 1974. (33 references)

The possible mutagenicity of DDT in mice, *D. melanogaster*, and *N. crassa* was examined. Acute oral doses of DDT (2 × 150 mg/kg) in male mice induced dominant lethal mutations in early spermatid and spermatocyte stages. A persistent increase in the number of dominant lethal mutations resulted from chronic oral doses of DDT (2 × 100 mg/kg/week for 10 weeks). Chronic treat-

ment caused changes in seminiferous tubule morphology and degeneration of B-type spermatogonia. Acute treatment increased spermatocyte chromosome breakage, stickiness, and precocious separation of the X and Y bivalent. An increase in dominant lethality in early spermatid and spermatocyte stages was noted on oral treatment of male Canton-S *D. melanogaster* with DDT. Nondisjunction of the X and Y chromosomes at the spermatocyte stage in treated male *v/R(1)2,vf/Bs Yy + D. melanogaster* resulted from DDT treatment. DDT treatment for 8 months of a population of Canton-S *D. melanogaster* caused no increase in frequency of second-chromosome recessive lethal mutations. Only inconclusive results were obtained when testing for induction of recessive lethal mutations in the *ad*-3 region of an *N. crassa* heterokaryon. DDT did not, however, appear to be mutagenic in the host-mediated assay with *N. crassa* and mice as the host. The results of this study allow the conclusion that DDT has a deleterious effect on reproduction in mice and is a weak mutagen in both mice and *D. melanogaster*.

75-3029. Bhagwat, V. M.; Ramachandran, B. V. (Biochem. Div., Natl. Chem. Lab., Poona, India). **Malathion A and B esterases of mouse liver. I. Separation and properties.** *Biochem. Pharmacol.* 24(18): 1713-1717; 1975. (26 references)

The hydrolysis of malathion [*S*-(1,2-dicarbethoxyethyl) *O,O*-dimethyl phosphorodithioate] is catalyzed by two types of enzymes in the mouse liver. The first is malathion B-esterase which hydrolyzes one of the carboxyethyl ester groups giving malathion mono-acid. This is a B type esterase, being sensitive to low concentrations of DFP (diisopropyl phosphorofluoridate), paraoxon (diethyl *p*-nitrophenyl phosphate), and EPNO, the oxygen analogue of EPN (*O*-ethyl *O*-*p*-nitrophenyl phenylphosphorothioate). It is predominantly in the microsomes, acts at pH 7.4-7.6, and is probably the same as the non-specific carboxylesterases (EC 3.1.1.1). The second enzyme is malathion A-esterase which is insensitive to DFP and other organophosphates even at high concentrations. It is predominantly in the cell-sap, has an optimum pH of 8.8, requires 2-mercaptoethanol, reduced glutathione or similar SH compounds for activation, and is inhibited by *p*-chloromercuribenzoate and heavy metals. The A esterase degrades malathion at the P-S linkage giving *O,O*-dimethyl phosphorothioate. (Author abstract by permission)

75-3030. Maglothin, J. A.; Wins, P.; Wilson, I. B. (Dep. Chem., Univ. Colorado, Boulder, CO 80302). **Reactivation and aging of diphenyl phosphoryl acetylcholinesterase.** *Biochim. Biophys. Acta* 403(2): 370-387; 1975. (35 references)

Acetylcholinesterase (acetylcholine hydrolase, EC 3.1.1.7) is readily inhibited by 10 μM diphenylphosphorochloridate even though the inhibitor hydrolyzes in a few seconds. The fluoridate is a much weaker inhibitor. The inhibited enzyme, diphenyl phosphoryl enzyme, spontaneously recovers only about 50% of its activity with a half time of about 17 min at pH 7.0 and 6 min at pH 8.0. The fact that only 50% of the original activity returns is due to aging. The rates of reactivation and aging can be very greatly increased by a few percent of an organic solvent. Depending on the solvent, even 1% may increase the rates by a factor of 5 or 6. The highest increase in rate was 70-fold. Quaternary NH_4 also increases the rates. Organic solvents and NH_4 also accelerate the reactivation of the much more stable diethyl phosphoryl enzyme derivative. (Author abstract by permission)

75-3031. Guttowa, A.; Grabiec, S. (Inst. Parasitol., Polish Acad. Sci., Warsaw, Poland). **Effect of chronic action of sublethal pesticide concentrations (sodium methyldithiocarbamate—VAPAM) activity on the** metabolic activity of *Fasciola hepatica* (Trematoda) and *Triaenophorus nodulosus* (Cestoda) embryos. *Bull. Acad. Pol. Sci. Ser. Sci. Biol.* 22(5): 329-334; 1974. (7 references)

A study was undertaken of the influence of low concentrations of pesticides of the methylcarbamate group acting during the entire embryonic development period on the reduction-oxidation activity of the embryos of *F. hepatica* and *T. nodulosus*. To determine the activity of oxidative-reductive biocatalysts in homogenates of *F. hepatica* eggs, three types of experiments were performed. The first type was concerned with the action of biocatalysts in homogenates of *F. hepatica* eggs developing in well water. The second studied the action of the biocatalysts from *F. hepatica* eggs developing in a water solution of VAPAM of 0.1 ppm. In the third kind of experiments, homogenates of eggs developing in a VAPAM solution of 1 ppm were added to the model reaction. In studying the activity of oxidative-reductive biocatalysts in egg homogenates of *T. nodulosus*, the homogenates exhibited less intensive capability of catalyzing the model reaction. Catalysis of the model reaction by cestode egg homogenates developing in VAPAM of 0.1 to 1.0 ppm was much less intensive. It was determined that a pesticide concentration of 0.1 ppm markedly reduced the activity of reduction-oxidation biocatalysts in the embryos of both parasites. At 1 ppm concentration, the metabolic activity of the embryos of *F. hepatica* were stimulated in the first day of their development. On the 6th day, a drastic decrease of activity occurred and the eggs died. These investigations demonstrated that the action of the chemical agent, even in sublethal doses, markedly reduced the metabolic activity of *F. hepatica* embryos in the course of their development which lasts at 20° on the average of 21 days.

75-3032. Oledzka-Slotwinska, H. (Inst. Histol., Med. Acad., Szczecin, Poland). **Effets de la simazine sur l'ultrastructure des hepatocytes et l'activite des certaines hydrolases. [Effects of simazine on hepatocyte ultrastructure and on the activity of certain hydrolases.]** *Bull. Assoc. Anat.* 58(161): 445-446; 1974. (French)

The fine structure of hepatocytes and liver enzyme activities were studied in male albino rats that received 15 mg/kg doses of simazine daily through stomach tubes for 3 or 28 days. The heptaic parenchyma showed a few focal lesions after 3 days, which, however, failed to intensify in the further course of the treatment. Despite the degeneration of a few hepatocytes during the first days, the hepatocytes adapted themselves to the changed conditions. The hepatocytes showed increased metabolic and enzymatic activity from the first days of poisoning, and produced substances suggestive of simazine metabolites. No simazine was detectable in liver homogenates after poisoning for 6-7 days, which indicates the intact detoxifying capacity of the hepatocytes.

75-3033. Kendall, M. W. (Dep. Anat., Univ. Mississippi Sch. Med., Jackson, MS 39216). **Acute hepatotoxic effects of mirex in the rat.** *Bull. Environ. Contam. Toxicol.* 12(5): 617-621; 1974. (10 references)

The oral median lethal dose of mirex (365 mg/kg) was administered i.p. in corn oil to 50 Sherman strain female rats. Fifty other animals were fed a total of 365 mg/kg mirex in their diet over a 12-day period. After 12 days, the liver tissues were examined histologically. In the i.p. group, mirex produced an apparent depletion of stainable glycogen, hepatocyte enlargement, periportal liposis associated with central necrosis, and infrequent foci of necrosis on the surface. In the dietary mirex group, the pesticide produced similar hepatic changes, but produced no surface lesions; 46% of these animals died before the twelfth day and the survivors exhibited obvious lethargy, loss of weight and hair, tremor, and diarrhea. The distinctive histologic pattern of periportal liposis produced by this polyhalogen may be utilized as an important aspect of mirex toxicity in rats since very few compounds are capable of inducing the accumulation of lipid in the periportal pattern.

75-3034. Roales, R. R.; Perlmutter, A. (Lab. Aquatic Biol., Dep. Biol. Grad. Sch. Arts Sci., New York Univ., New York, NY 10003). **Toxicity of methylmercury and copper, applied singly and jointly, to the blue gourami, *Trichogaster trichopterus*.** *Bull. Environ. Contam. Toxicol.* 12(5): 633-639; 1974. (23 references)

Adult blue gouramis (*Trichogaster trichopterus*) were exposed to de-ionized New York City tap water containing varying concentrations of methylmercury and/or copper, and the 24, 48, and 96 hr TLm were determined. Both compounds were highly toxic to the fish, but methylmercury was slightly more toxic, especially at 24 and 48 hr. The interaction curve for the two compounds indicated antagonism, particularly at low to moderately high doses of copper. The percent kill over a 96-hr period was significantly less with mixtures of 80% mercury plus 20% copper, 60% mercury plus 40% copper, and 40% mercury plus 60% copper as compared with 100% mercury, 100% copper, and 20% mercury plus 80% copper. The data suggests that copper protects the fish from the toxic effects of methylmercury by a mechanism as yet unknown.

75-3035. Peakall, D. B. (Sect. Ecol. Systematics, Cornell Univ., Ithaca, NY 14850). **Effects of di-*n*-butyl and di-2-ethylhexyl phthalate on the eggs of ring doves.** *Bull. Environ. Contam. Toxicol.* 12(6): 698-702; 1974. (12 references)

Pairs of ring doves (*Streptopelia risoria*) were maintained on diets containing 10 ppm di-*n*-butyl phthalate (DNBP) or 10 ppm di-2-ethylhexyl phthalate (DEHP). The eggshell index (weight in mg divided by the product of the length times breadth, in mm) and permeability of the eggs were determined and cross sections of the shells were examined under a scanning electron microscope. Eggshell thickness was decreased by 23% and permeability to water was increased by 10% by the DNBP diet. In addition, small dents occurred frequently in the eggs from the DNBP-fed birds, and more fibrous materials were present in the shells than in the shells of control eggs. The size and distribution of pores in the eggshells appeared to be unaffected. The eggs from the DEHP-fed birds and from birds fed DNBP followed by uncontaminated food did not differ significantly from the controls. The data suggests that only under circumstances where DNBP is continually available in the food could this compound be of importance in eggshell thinning.

75-3036. Baudouin, M. F.; Scoppa, P. (Comm. Eur. Communities, Joint Res. Cent., Biol. Div., ISPRA Establ., Ispra, Italy). **Acute toxicity of various metals to freshwater zooplankton.** *Bull. Environ. Contam. Toxicol.* 12(6): 745-751; 1974. (11 references)

Freshwater zooplankton (*Cyclops abyssorum prealpinus* (Einsle), *Eudiaptomus padanus padanus* (Burkhard), and *Daphnia hyalina* (Leydig)) were exposed to filtered water from Lake Monate (an unpolluted subalpine Italian lake) containing various concentrations of magnesium, calcium, strontium, cesium, chromium (VI), cobalt (II), nickel (II), lead (II), mercury (II), cadmium (II), and/or copper (II). Calcium was practically nontoxic, magnesium, strontium, and cesium showed low toxicity, and the divalent heavy metals and chromate were highly toxic. *Cyclops abyssorum* was the most resistant species, whereas *Daphnia hyalina* was considerably more sensitive than the copepods. The median lethal concentrations of metals to *Cyclops* and *Daphnia* were significantly correlated with the solubility products of the metal sulfides; toxicity was also correlated with metal electronegativity and equilibrium constant for the metal-adenosine triphosphate complex. Toxicity curves showed that for each pair metal-species of zooplankton there was a straight line relation between median effective time and metal concentration, without any evidence of a lethal threshold. The mechanisms of toxic action of the metals to zooplankton are unknown. *Daphnia* was shown to be a useful test organism for heavy metal pollutants.

75-3037. Olson, K.; Boush, G. M. (Dep. Entomol., Univ. Wisconsin, Madison, WI 53706). **Decreased learning capacity in rats exposed prenatally and postnatally to low doses of mercury.** *Bull. Environ. Contam. Toxicol.* 13(1): 73-79; 1975. (10 references)

Pregnant Holtzman rats and the subsequent offspring were maintained on standard rat chow (controls), on lyophilized, powdered Pacific blue marlin (*Makaira ampla*) plus rat chow containing 2 ppm mercury per kg diet, or on albacore tuna (*Thunnus alalunga*) plus rat chow containing 2 ppm total mercury per kg diet. The offspring were tested for swimming ability and righting reflex at 7-17 days of age and for motivation and maze learning at 45-68 days of age. The marlin-fed rats were significantly smaller than the controls but the three groups did not differ in appearance or age at eye opening. The marlin-fed rats, but not the tuna-fed rats, also showed retarded maturation with respect to swimming behavior and righting reflexes. Similarly, the marlin-fed group showed a significant learning deficit with respect to maze learning in comparison with both the controls and the tuna-fed group. The groups did not differ significantly in the motivational tests. The total mercury concentrations in the brain, kidney, and liver were highest in the tuna-fed group and lowest in the control group, but the organs in the three groups did not differ significantly in terms of weight or morphology. Heavy metal analyses of the tuna and marlin diet revealed a significantly higher concentration of cadmium in the tuna diet, but all heavy metal concentrations were well within allowable minimum daily uptake standards.

75-3038. Blend, M. J. (Dep. Biol., Univ. Detroit, Detroit, MI 48221). **In vitro uptake of labeled androgens by prostate tissue in the presence of dieldrin.** *Bull. Environ. Contam. Toxicol.* 13(1): 80-85; 1975. (11 references)

Ventral lateral prostate tissue was obtained from Carworth CFE Strain rats which had been castrated 8 days earlier. The tissues were incubated for 60 min with insulin (80 I.U./ml), testosterone-7-^{3}H (1.82 μg/ml), 5α-dihydrotestosterone-1,2-^{3}H (0.2 μg/ml), and/or dieldrin (0.17-170 μg/ml). Dieldrin at all concentrations decreased the incorporation of labeled testosterone by the prostatic tissues; the decrease was dose related, ranging from 4% with 0.17 μg/ml dieldrin to greater than 99% with 170.0 μg/ml dieldrin. Similarly, dieldrin inhibited the uptake of 5α-dihydrotestosterone-1,2-^{3}H in a dose-dependent fashion, the degree of inhibition ranging from 22 to 96%. This data coupled with previous findings indicates that dieldrin may bind or associate with the androgen receptor proteins in such a way as to decrease the uptake and retention of androgens by hormone-responsive tissues in the male.

75-3039. Petrocelli, S. R.; Anderson, J. W.; Hanks, A. R. (Dep. Biol., Texas A.&M. Univ., College Station, TX 77843). **Biomagnification of dieldrin residues by food-chain transfer from clams to blue crabs under controlled conditons.** *Bull. Environ. Contam. Toxicol.* 13(1): 108-116; 1975. (27 references)

Marsh clams (*Rangia cuneata*) were maintained for 36 hr in aerated sea water containing dieldrin (5.5 μg/l) after which they were homogenized and fed to blue crabs (*Callinectes sapidus*) at a rate of 3 g/day. Controls were fed unexposed clams. Dieldrin residues in the crabs and clams were determined by electron capture gas-liquid chromatography. The contaminated clams contained dieldrin in concentrations of 181-193 μg/kg, while the unexposed clams contained 0 or trace residues. *Callinectes* fed the contaminated meat concentrated dieldrin residues to 4.7 and 6.8 times the daily dose after 10 days of feeding and to 3.9 times after 5 days. No dieldrin was detected in the water in which the crabs were maintained. The percent dieldrin retained in the crab tissues through feeding on contaminated clam meat varied from 68-78%. Under natural conditions in the field, animals consuming contaminated meat for several months or years might have much higher concentration factors.

75-3040. Curley, A.; Burse, V. W.; Jennings, R. W.; Villanueva, E. C.; Kimbrough, R. D. (Environ. Protect. Agency, Chamblee Toxicol. Lab., Chamblee, GA 30341). **Evidence of tetrachlorodibenzofuran (TCDF) in Aroclor 1254, and the urine of rats following dietary exposure to Aroclor 1254.** *Bull. Environ. Contam. Toxicol.* 14(2): 153-158; 1975. (11 references)

Sixteen-day urine samples were collected from male Sherman rats which had been given 100 ppm Aroclor 1254 in the diet for 4-58 days or 500 ppm Aroclor 1254 for 252 days. Seven-day urine samples were collected from female rats which had been fed 100 ppm per day of Aroclor 1254 for 8 mo. The mass spectra of the male urine showed the presence of pentachlorobiphenyl and a fragment resulting from the loss of 70 mass units. In addition, a molecular ion at M^+/e 304 contained an isotopic cluster indicative of four Cl, with one major fragment at M^+/e 235 indicative of the loss of two Cl. Fraction V resulting from the florisil elution of Aroclor 1254 contained hexachlorobiphenyl, pentachlorobiphenyl, tri- and tetrachlorbiphenyl fragments and the molecular ion M^+/e 304 with an isotopic cluster indicative of 4 Cl. The spectrum produced by methylated urine indicated the presence of a monomethoxy derivative of pentachlorobiphenyl and the molecular ion M^+/e 304. The molecular ion M^+/e was also present in the methylated urine from the females, and a trace level of the 304 tetrachloro component was present in a commercial PCB preparation. It is likely that the 304 component was tetrachlorodibenzofuran.

75-3041. Yap, H. H.; Desaiah, D.; Cutkomp, L. K.; Koch, R. B. (Dep. Entomol., Fisheries Wildlife, Univ. Minnesota, St. Paul, MN 55108). **In vitro inhibition of fish brain ATPase activity by cyclodiene insecticides and related compounds.** *Bull. Environ. Contam. Toxicol.* 14(2): 163-167; 1975. (16 references)

The insecticidal isomers of chlordane and heptachlor produced a strong in vitro inhibition of fish

(*Lepomis macrochirus*) brain oligomycin-sensitive (mitochondrial) Mg^{2+} ATPase. The chlordane isomers and isobenzan also inhibited Na^{+}-K^{+} ATPase. Except for aldrin, the chlorinated naphthalenes stimulated the mitochondrial Mg^{2+} ATPase but inhibited the other ATPases to varying degrees. A variety of other chlorinated hydrocarbon pesticides strongly inhibited the ATPase system. There was a strong correlation between certain neurotoxic effects and ATPase inhibition; e.g., among the cyclodiene insecticides, nearly all of the chlordane analogs shortened the latent period in nerve cord preparations from German cockroaches to a greater extent than did the aldrin group and mirex. In general, the compounds producing the shortest latent periods were the best inhibitors of the ATPases.

75-3042. Krause, W.; Hamm, K.; Weissmueller, J. (Dep. Androl., Cent. Dermatol., Fac. Med., Justus Liebig-Univ., Giessen, West Germany). **The effect of DDT on spermatogenesis of the juvenile rat.** *Bull. Environ. Contam. Toxicol.* 14(2): 171-179; 1975. (16 references)

Juvenile male rats of the Wistar/Han strain were fed DDT suspended in olive oil. The dosages were 500 mg/kg during the fourth and fifth days of life or 200 mg/kg daily from the fourth through the twenty-third days of life. The testes were examined histologically at various intervals thereafter, and fertility was tested on the sixtieth and ninetieth days of life. The testicular weight, but not the body weight, was reduced by DDT treatment. The tubular diameters were initially decreased but later approached control values. The tubular cells, however, showed significant decreases in the number of Sertoli cells, A-spermatogonia, pachytene spermatocytes, and spermatids. In addition, the litters of normal female rats mated with the treated males were smaller than those of females mated with control males. The data indicates that the disturbance in spermatogenesis was due to a lack of local testosterone; it also indicates the potential danger presented by DDT to the propagation of species.

75-3043. Lee, J. H.; Sylvester, J. R.; Nash, C. E. (Oceanic Inst., Makapuu Point, Waimanalo, HI 96795). **Effects of mirex and methoxychlor on juvenile and adult striped mullet, *Mugil cephalus* L.** *Bull. Environ. Contam. Toxicol.* 14(2): 180-186; 1975. (13 references)

Juvenile and adult striped mullet (*Mugil cephalus* L.) were exposed to mirex or methoxychlor (0.01, 0.1-1.0, or 10.0 ppm) under continuous flow (260 ml/min insecticide solution and seawater) conditions. The highest 96-hr mortality rates were 32.1% and 26.9% in the youngest juvenile fish exposed to 1.0 and 0.1 ppm mirex, respectively. There were no mortalities among the older juveniles or adults. The mirex residue levels were highest in the adults, possibly because the adults have a relatively high proportion of body fat in comparison with the juveniles; the mirex residue levels increased with increasing insecticide concentration in the water. At 10.0 ppm, methoxychlor caused 100% mortality in the young juveniles within 3 hr and in the adults within 6 hr. At 1.0 ppm, all juveniles died within 9 hr and all adults died within 15 hr, and at 0.1 ppm, 95% of the juveniles and 63% of the adults died within 48 hr. The poisoned mullet showed stress behavior throughout the experiment. The accumulation of methoxychlor residues in the tissues was relatively low.

75-3044. Pawar, S. S.; Makhija, S. J. (Biochem. Div., Dep. Chem., Marathwada Univ., Aurangabad, Maharashtra, India). **Effect of insecticide intoxication on the hepatic microsomal electron transport reactions, during dietary protein variations in young rats.** *Bull. Environ. Contam. Toxicol.* 14(2): 197-204; 1975. (18 references)

Young male CF rats were maintained for 2 weeks on low protein (5% casein), high protein (30% casein), or control (18% casein) diets, after which they were injected i.p. 2 successive days with malathion (150 mg/kg/day), Baygon (propoxur, 10 mg/kg), or corn oil (controls). The relative liver weights were increased by insecticide intoxication, the increase being more pronounced in the animals fed the low-protein diet. Baygon and malathion also decreased the liver microsomal aminopyrine *N*-demethylase activity, the decrease being greater in the low-protein group. Baygon produced a decrease in the activity of ethylmorphine *N*-demethylase of the low-protein group, while malathion produced a noticeable increase in activity. In the high protein group, both pesticides produced decreases in ethylmorphine *N*-demethylase and acetanilide hydroxylase; in the low protein group, Baygon increased the acetanilide hydroxylase activity and malathion had no effect. Baygon produced decreases in cytochrome b5, cytochrome c reductase, and heme in both the low and high protein groups and malathion produced similar decreases in the high protein group. In the low protein group, malathion caused a decrease in cytochrome c reductase but an increase in cytochrome b5. Decreases in pyridine binding spectra were observed in both the low and high protein groups during insecticide intoxication, but the magnitude of decrease was greater in the low protein group. The liver microsomal enzymatic and nonenzymatic lipid peroxidations were increased during insecticide treatment in all groups, the magnitude of the Baygon-induced increase in lipid peroxidation being highest in the high protein group and the magnitude of the malathion-induced increase being highest in the low protein group.

75-3045. Jordan, M.; Srebro, Z.; Pierscinska, E.; Wozny, L. (Inst. Systematic Exp. Zool., Dep. Exp. Zool., Polish Acad. Sci., Cracow, Poland). **Preliminary observations on the effects on the organs of mice of administering some carbamate pesticides.** *Bull. Environ. Contam. Toxicol.* 14(2): 205-208; 1975. (9 references)

Male Balb mice were treated i.p. with 20 mg/kg/day of Karbatox (carbaryl), Unden (propoxur), or physiological saline (controls). After 10 or 20 days, the animals were killed and the intestine, testes, liver, kidneys, brain, and

hypophysis were examined histologically. Both Karbatox and Unden showed comparatively low toxicity in the experimental animals, and the testes, spermatogenesis, and kidneys were normal in all animals. However, in the animals treated for 20 days with Unden, hypertrophy of the intestinal epithelium was noted, along with a decrease in size of the liver cells, decreased liver cell vacuolation, and a reduction in the number of nuclear inclusions within the liver cells. Additional findings in the pesticide-treated mice included a significant increase in the number of Gomori-positive glia cells and an increase in the volume of cell nuclei in the neurosecretory neurocytes of the hypothalamus.

75-3046. Gupta, P. K.; Kohli, J. D. (Ind. Toxicol. Res. Cent., Lucknow, India). **Acute toxicity of iomex—a petroleum weedicide.** *Bull. Environ. Contam. Toxicol.* 14(2): 241-249; 1975. (6 references)

Iomex was administered i.p. to mice (5-15 ml), rats (5-10 ml), guinea pigs (5-15 ml), and rabbits (5-7 ml/kg), intratracheally to rats (0.25-1 mg/kg), and by gastric intubation to mice, rats (both 5 and 20 ml/kg), and rabbits (5-12 m/kg). There was little or no mortality among mice, rats, or guinea pigs given 5 ml/kg iomex by the oral or i.p. routes, but there was 50% mortality among rats given 5 ml/kg i.p. There were no changes in behavior at this dose level, whereas symptoms related to CNS depression were noted at 7.5-10 ml/kg. With lethal doses, there was a decrease in spontaneous activity, loss of response to painful stimuli, loss of motility and corneal reflex, and deep coma. I.p. administration of lethal doses caused mild pulmonary congestion, fatty degeneration of the liver, and renal hyperemia; oral administration produced intestinal congestion and gas; and intratracheal administration produced pulmonary hemorrhage, the severity of which was dose related. Instillation of 0.1 ml iomex into the rabbit eye produced conjunctival congestion, and repeated administration caused conjuctivitis, congestion, lacrimation, and loss of hair around the eye; these effects were reversible. I.p. iomex significantly increased the serum, but not the liver, GOT and GPT values.

75-3047. Clark, D. R., Jr. (U.S. Fish Wildlife Serv., Patuxent Wildlife Res. Cent., Laurel, MD 20811). **Effect of stress on dieldrin toxicity to male redwinged blackbirds (*Agelaius phoeniceus*).** *Bull. Environ. Contam. Toxicol.* 14(2): 250-256; 1975. (3 references)

Male redwinged blackbirds (*Agelaius phoeniceus*) were confined separately in large, outdoor cages. Half of the birds were fed a diet containing 10 ppm aldrin, and half of the aldrin-fed and control-fed birds were stressed (by a human entering the cage) for 4 min five times daily. Pesticide residues in the brains and carcasses were determined by electron capture gas chromatography. The lethal level of dieldrin in the brain was greater in the stressed birds (22.2 ppm) than in the unstressed birds (19.8 ppm). The dieldrin concentrations in the carcasses increased linearly with time and showed no tendency to level off, and the dieldrin concentrations in the carcasses of the stressed birds at death were significantly smaller than in the unstressed birds. Mean weight loss at death was 30.7% in the unstressed aldrin-fed birds and 30.1% in the stressed aldrin-fed birds. Weight loss was 13.7% and 15.3% in the unstressed and stressed controls, respectively. Dieldrin alone appeared to cause marked fat loss within 16 days, and stress appeared to hasten this loss; the stressed birds had significantly less fat than the unstressed birds, but the fat content in the brain did not vary significantly from group to group. The data does not support the hypothesis that stress heightens the lethality of dieldrin residues in the brains of birds.

75-3048. Chaiyarach, S.; Ratananun, V.; Harrel, R. C. (Biol. Dep., Lamar Univ., Beaumont, TX 77710). **Acute toxicity of the insecticides toxaphene and carbaryl and the herbicides propanil and molinate to four species of aquatic organisms.** *Bull. Environ. Contam. Toxicol.* 14(3): 281-284; 1975. (5 references)

The median 24, 48, 72, and 96 hr tolerance limits (TLm) of toxaphene, carbaryl, propanil, and molinate in mosquitofish (*Gambusia affinis*), grass shrimp (*Palaemonetes kadiakensis*), crayfish (*Procambarus simulans*), and mactrid clams (*Rangia cuneata*) were determined under laboratory conditions. Toxaphene was the most toxic of the pesticides to all species except *Rangia cuneata*; molinate was the most toxic to this species. Carbaryl was slightly more toxic in powder form than when dissolved in acetone, and *Rangia cuneata* was the most tolerant of the species tested to all four biocides. Carbaryl was most toxic to *Palaemonetes kadiakensis*, and propanil was most toxic to *Gambusia affinis*.

75-3049. Villeneuve, D. C.; Newsome, W. H. (Fd. Res. Div., Health Protect. Br., Tunney's Pasture, Ottawa, Ontario, Canada). **Toxicity and tissue levels in the rat and guinea pig following acute hexachlorobenzene administration.** *Bull. Environ. Contam. Toxicol.* 14(3): 297-300; 1975. (12 references)

Male and female Wistar rats and guinea pigs were dosed daily (p.o.) with hexachlorobenzene (500 mg/kg) in corn oil for 16 days. The liver and brain tissues were analyzed for HCB residues immediately after death or 24 hr after the last treatment. Analysis was by electron capture gas chromatography. Eight of the 11 male rats and five of the 11 female rats died during HCB administration. Although weight loss at death was similar in both sexes, more doses of HCB were required to effect this weight loss in the males. The brain and liver HCB levels were the same in both sexes. Among the animals that lived throughout the experiment, the males gained weight and the females lost weight, although not as much as did those who died. Again, the brain and liver residue levels were similar regardless of sex. All of the guinea pigs died during HCB treatment, but the males lost more weight than the females and accumu-

lated more HCB in the brain and liver tissues than the females. The tissue accumulation of HCB was greater in the rat than in the guinea pig, despite the greater susceptibility of the latter to the toxic effects of HCB.

75-3050. Morita, M.; Oishi, S. (Tokyo Metrop. Res. Lab. Pub. Health, Tokyo, Japan). **Clearance and tissue distribution of hexachlorobenzene in rats.** *Bull. Environ. Contam. Toxicol.* 14(3): 313-318; 1975. (18 references)

Male Wistar rats aged 7 weeks were given a single i.p. injection of hexachlorobenzene (HCB) (2.0 mg) in olive oil. The animals were killed at various times between 2 hr and 56 days thereafter, and the distribution of HCB in the tissues was determined by gas chromatography. HCB was located primarily in the fat; lower concentrations were found in other organs. In most organs, the HCB concentration reached a maximum within 6-12 hr then decreased rapidly for 14 days. From 14 to 56 days, the HCB concentration remained relatively constant at 8, 5, 37, 40, and 41 ppm for the brain heart, liver, kidneys, and testes, respectively. The HCB level in the blood was closely correlated with the whole body concentration and the levels in the brain and testes. Levels in the brain and fat were also correlated with the total body concentration. In contrast the HCB level in the organs, which declined quickly up to 14 days and slowly thereafter, the whole body HCB concentration declined at a steady rate with a half life of 60 days; this corresponds to the half life of HCB in the organs between 14 and 56 days. Pentachlorobenzene was not detected in any of the organs or the fat. The HCB-treated animals did not differ from untreated controls in terms of body or organ weights or pathological findings.

75-3051. Woods, A. E.; Morgan, P. E.; Coates, J. T. (Dep. Chem., Middle Tennessee State Univ., Murfreesboro, TN 37130). **Toxicity, acetylcholinesterase inhibition and metabolism of enolic phosphate esters resembling the insecticide, phosdrin.** *Bull. Environ. Contam. Toxicol.* 14(3): 325-329; 1975. (9 references)

Male and female hooded rats were injected i.p. with varying amounts of two compounds (I and II) prepared from β-bromo-α-ketoacid methyl esters; these compounds closely resemble the insecticide phosdrin in structure. Rat liver homogenates were also incubated with phosdrin and its homologs and the metabolism of these compounds was determined, as were their effects on bovine erythrocyte acetylcholinesterase activity. Compounds I and II caused no fatalities at doses up to 250 mg/kg. Both compounds were metabolized by the liver homogenates to dimethylphosphate, and inorganic phosphate was also found in the aqueous extract of the metabolism mixtures. Both compounds caused about the same degree of inhibition of bovine erythrocyte acetylcholinesterase, both being 2-3-fold less active in this respect than phosdrin.

75-3052. Anderson, A. C.; Abdelghani, A. A.; Smith, P. M.; Mason, J. W.; Englande, A. J., Jr. (Dep. Environ. Health Sci., Tulane Univ., New Orleans, LA 70112). **The acute toxicity of MSMA to black bass (*Micropterus dolomieu*), crayfish (*Procambarua* sp.) and channel catfish (*Ictalurus lacustris*).** *Bull. Environ. Contam. Toxicol.* 14(3): 330-333; 1975. (13 references)

Static bioassays were performed to determine the acute toxicity of the herbicide MSMA in black bass (*Micropterus dolomieu*), crayfish (*Procambarua spp.*), and channel catfish (*Ictalurus lacustris*). Of the species tested, the fingerling black bass were the most sensitive to the pesticide; the 48-hr and 96-hr median lethal thresholds (TLMs) in these fish were 1660 mg/l and 900 mg/l, respectively. The 48-hr and 96-hr TLMs in the crayfish were 5100 mg/l and 1100 mg/l, respectively, while those in the catfish were 4700 mg/l and 3050 mg/l, respectively. The data shows good tolerance to MSMA in all three species and indicates that acute toxicity problems are not likely to arise in these species under conditions of routine field application. However, the data does not indicate variations in acute toxicity which might occur due to differences in age or environmental stress, nor does it preclude the possibility of biological concentration of the herbicide or possible toxicity of the degradation products of MSMA.

75-3053. Staiff, D. C.; Comer, S. W.; Armstrong, J. F.; Wolfe, H. R. (Field Studies Sect., Pesticides Toxic Substances Effects Lab., U.S. EPA, Wenatchee, WA 98801). **Exposure to the herbicide, paraquat.** *Bull. Environ. Contam. Toxicol.* 14(3): 334-340; 1975. (10 references)

Field exposure tests to paraquat were conducted on workers operating tractor-mounted low-boom spray equipment in orchards; the dosage herbicide was 4.677 l/ha. Exposure tests for yard and garden application were performed with volunteers who were spot-applying 0.44% paraquat to weeds and grass. Pressurized dispenser container nozzles were also analyzed for paraquat contamination, and potential oral exposure values for dispenser discharge were studied to determine potential hazards to small children placing the nozzle in their mouths. The data indicated that under the conditions described, the hazard presented by dermal and respiratory exposure to paraquat in field applicators and persons using the yard and garden pressurized dispenser is minimal. With regard to the potential hazards to small children, the highest value for nozzle contamination was 0.25 mg of paraquat, the highest value for a brief nozzle discharge was 0.53 mg, and the highest value for a 1-sec discharge was 1.74 mg paraquat. Based on acute oral toxicity studies in rats, even the 1.74 mg maximum should represent only 0.14% of the toxic dose for a 27 lb child. The mildly caustic nature of the formulation and its 15% aliphatic petroleum solvent content should also be considered when evaluating the potential hazard to children.

75-3054. Kanazawa, J. (Natl. Inst. Agric. Sci., Tokyo, Japan). **Uptake and excretion of organophosphorus and carbamate insecticides by fresh water fish, Motsugo,**

***Pseudorasbora parva*. *Bull. Environ. Contam. Toxicol.* 14(3): 346-352; 1975. (11 references)**

Motsugo fish (*Pseudorasbora parva*) were maintained for 30 days in fresh water tanks containing 0.6-1.2 ppm malathion, diazinon, fenitrothion, carbaryl, Osbac, or 3,5-dimethylphenyl *N*-methylcarbamate (XMC, maqbarl) The pesticide concentrations in the fish were determined by gas-liquid chromatography. Of the three organophosphorus insecticides, diazinon was the most stable in water and malathion was the most unstable. The uptake of diazinon and fenitrothion by the fish was greater than that of malathion, and malathion was metabolized more rapidly than the other two. About 40% of the fish exposed to diazinon and 10% of those exposed to fenitrothion developed a permanent spinal curvature of the back bone; this deformity was not seen in the fish exposed to malathion. Of the carbamate insecticides, XMC was the most stable and carbaryl was the least stable. Uptake by the Motsugo was highest for carbaryl and lowest for XMC, but carbaryl was much more rapidly metabolized than the other two. About 30% of the fish exposed to Osbac developed the same spinal deformity seen in the fish exposed to diazinon and fenitrothion. It appeared that the uptake of the carbamate insecticides was generally lower than that of the organophosphorus insecticides diazinon and fenitrothion.

75-3055. Foster, M. G. (Dep. Biol., York Univ., Toronto, Ontario, Canada). **The in vivo antifungal effects of benomyl on non-target soil fungi.** *Bull. Environ. Contam. Toxicol.* 14(3): 353-360; 1975. (6 references)

Plots of clay-loam soil sown with winter wheat were treated with aqueous suspensions of benomyl (0.5 gm/m^3) or Benlate (0.5-2.0 gm/m^3). The soil was sampled over a 32-day period after fungicide application and the populations of fungi representing five genera (*Mucor, Rhizopus, Penicillium, Trichoderma*, and *Fusarium*) were determined using the dilution-plate method. Fungicide application was followed by a rapid decline in the total number of fungi, the depletion first being evident after only 24 hr. The fungicidal effects were greater with benlate (0.5 gm/m^3) than with the same concentration of benomyl. These effects were long-lasting; a significant reduction in the fungal population was evident 24 days after benomyl application and at least 32 days after benlate application. *Mucor* and *Rhizopus* were not significantly affected by a single application of benomyl, but the other three genera were dramatically affected. The numbers of *Penicillia* and *Trichoderma* were reduced by about 70%, and those of *Fusarium* were reduced by about 90%. The results indicate that a single application of benomyl at a soil drench concentration of 50 ppm in aqueous suspension greatly disrupted the beneficial saprophytic fungi as well as the potentially dangerous plant pathogens.

75-3056. Berry, C. R., Jr.; Schreck, C. B.; Van Horn, S. L. (Dep. Fisheries Wildlife Sci., Virginia Polytechnic Inst. State Univ., Blacksburg, VA 24061). **Aquatic macroinvertebrate response to field application of the combined herbicides diquat and endothall.** *Bull. Environ. Contam. Toxicol.* 14(3): 374-379; 1975. (13 references)

In July, 1973, a 1100-ha, shallow, freshwater impoundment overgrown with egeria was treated with a surface spray of a 1:1 mixture of diquat and endothall at a rate calculated to yield 0.11 ppm active ingredient diquat and 0.17 ppm active ingredient endothall at a depth of 144 cm. Herbicide levels in the water 2.5 and 1 m deep were determined 4-40 hr after treatment and on a daily basis for 1 mo thereafter. Microinvertebrates were collected at the same depths before and 3-21 days after treatment. Diquat reached a maximum concentration of 0.03 ppm in the deep area and 0.73 in the shallow area 12 hr after treatment. Endothall reached a maximum concentration of 0.08 ppm in the deep area by 24 hr and 3.25 ppm in the shallow area by 4 hr after treatment. Both herbicides had essentially dissipated 3 days after treatment. Chlorosis was apparent in the egeria leaves 2 days after treatment, and the plants no longer appeared at the water surface 5 days after treatment. After 14 days, healthy looking plants could be found only on the bottom. The average number of organisms collected after treatment at both depths was similar to the pretreatment value; also the number of taxa remained relatively constant. In the deep water, neither herbicide reached toxic levels for any of the taxa, while the diquat concentrations in the shallow water reached lethal levels for the amphipods in certain spots ('hot spots') but not for any of the other organisms; endothall did not occur in lethal levels for any organism.

75-3057. Corrin, B. (London, England). **Response of alveolar epithelium (pneumocytes I and II) to atmospheric pollution.** *Bull. Physio-Pathol. Resp.* 10(2): 235-236; 1974.

Type I and II pneumocytes compose the pulmonary alveolar epithelium. Macrophages, derived from blood monocytes, occur free in the alveolar space. Type I cells are more susceptible to air pollution, while type II cells may be a source of alveolar surfactant. Little phagocytotic function has been found in these cells. Irritant gases can cause alveolar necrosis. A proliferation of type II pneumocytes occurs in regeneration, as demonstrated after paraquat injection. These type II pneumocytes differentiate into type I cells. Persistent hyperplasia of type II pneumocytes is caused by chronic damage, reflecting the greater resistance to injury of the type II pneumocytes. However, the possible hyperactivity of surfactant secretion must be considered. Although surfactant is known to be inactivated by smoke, little evidence exists of a compensatory hypersecretion. It is suggested that alveolar proteinosis may represent a massive accumulation of surfactant and be a rare complication of atmospheric pollution.

75-3058. Dequidt, J.; Erb, F.; Brice, A.; Van Aerde, C. (Lab. Toxicol. Hyg. Atmos., Fac. Pharm., Lille, France). **Accumulation et transformation de l'heptachlore chez le rat.**

[**Accumulation and transformation of heptachlor in the rat.**] *Bull. Soc. Pharm. Lille* 4: 153-163; 1973. (9 references) (French)

The excretion, distribution, accumulation, and metabolism of heptachlor were studied in Wistar rats. The animals received 0.5 or 2.5 mg heptachlor daily by stomach tube for 2 to 4 weeks. The weekly urinary excretion was 1.598 μg during the second week, 2.537 μg during the third week, and 0.172 μg during the fourth week in rats treated with 0.5 mg heptachlor. The amount of heptachlor epoxide eliminated was 1.773 μg during the third week and 4.773 μg during the fourth week. In rats treated with 2.5 mg/day, heptachlor excretion was highest, at 9.518 μg, during the second week, and the heptachlor epoxide elimination peaked with 13.388 μg during the third week. Residue analyses in the blood, liver, kidneys, and brain revealed the accumulation of heptachlor and heptachlor epoxide. Nearly quantitative metabolism of heptachlor to heptachlor epoxide was observed. Further metabolites, proposed to be 1-chloro-3-hydroxy chlordene, 1-hydroxy chlordene, and 1-hydroxy-2,3-epoxy chlordene were also found in the organs.

75-3059. Jeyaratnam, J.; Forshaw, P. J. (Dep. Public Health and Preventive Med., Fac. Med., Univ. Sri Lanka, Colombo, Sri Lanka). **A study of the cardiac effects of DDT in laboratory animals.** *Bull. WHO* 51(5): 531-536; 1974. (20 references)

The claim that the hearts of animals chronically exposed to DDT are unduly sensitive to the cardiotoxic effects of vasopressin was reexamined. Rats and rabbits were fed a diet containing DDT for 8 months and were given weekly doses of vasopressin, which causes a temporary myocardial ischemia. Electrocardiograms, recorded at 2-week intervals, showed no significant increase in the incidence of cardiac arrhythmias in the DDT-fed animals. Intravenous noradrenaline given at the end of the 8-month period did not produce a greater incidence of arrhythmias in the DDT-fed animals than in the controls. Isolated heart muscle preparations from the DDT-fed and control rats did not differ in their peak developed tensions and maximum rates of tension development. DDT, TDE, and DDE levels in heart muscle and fat were below detectable levels in the control rats, whereas in the DDT-fed rats they were at least 100 times those normally found in human tissues. (Author abstract by permission)

75-3060. Vaidehi, B. K.; Delcourt, A.; Mestre, J. C. (Lab. Biol. Cell. Cryptog., Univ. Paris-Sud, Paris, France). **La toxicite de l'hydroxyde de phenylmercure sur les algues d'eau douce *Scenedesmus subspicatus* W. et W. et *Euglena gracilis* Klebs.** [**Toxicity of phenylmercury hydroxide to fresh-water algae, *Scenedesmus subspicatus* W. and W. and *Euglena gracilis* Klebs.**] *C. R. Hebd. Seances Acad. Sci. Ser. D* 279(23): 1801-1804; 1974. (8 references) (French)

The effect of phenylmercury hydroxide on the growth and morphology of *Euglena gracilis* Klebs and *Scenedesmus subspicatus* W. and W. was studied. Phenylmercury hydroxide was found to exert a lethal effect on both organisms at a well-defined concentration, while slightly lower concentrations were ineffective. A phenylmercury hydroxide concentration of 1 μM caused the death and deformation of cellular elements in *E. gracilis* Klebs, while a slightly lower concentration of 0.75 μM was ineffective. In the case of *Sc. subspicatus* W. and W., the lethal threshold concentration was found to be 25 μM. No progressive growth inhibition was observed at lower concentrations.

75-3061. Elskamp, D. M. W.; Meeter, E.; Berends, F. (Author address not given). **Toxicologie van organofosfaten.** [**Toxicology of organophosphates.**] *Chem. Tech. (Amsterdam)* 30(5): A21-A-25; 1975. (Dutch)

The biochemical mechanism of action of organophosphorus compounds is described, and a new antidote therapy in poisonings with such substances is proposed. It is possible to remove the phosphoryl group from cholinesterase inhibited by organophosphorus compounds with a suitable oxime immediately after inhibition, but if the inhibited enzyme is allowed to age it will not respond to oximes, i.e., activation is no longer possible. The organophosphate-induced suppression of the excitation of respiratory muscles can be eliminated by the new synthetic cevadine homologs, 3-chloro-2,5,6-trimethylbenzoic acid and 9-anthracenecarboxylic acid, whose effect is independent of the type of cholinesterase inhibitor and the severity of poisoning. These drugs can be used together with atropine and oximes. A combination of these drugs with diazepam is particularly effective. Paralysis of the respiratory system was successfully prevented by these new drugs in rats poisoned with high doses of paraoxon.

75-3062. Shu-hua, H.; Jui-chun, L.; Ch'ung-ch'ing, C. (Shanghai Inst. Parasit. Dis., Shanghai, China). **Combined oral F30066 and rectal dipterex in treatment of experimental *Schistosomiasis japonica*.** *Chin. Med. J.* 1(1): 51-59; 1975. (6 references)

This paper reports experimental studies on the combined use of oral F30066 and rectal dipterex (trichlorfon) in the treatment of adult schistosomes. The latter treatment is used to stimulate the hepatic shift of the worms inhabiting the inferior mesenteric vessels. These worms are more effectively treated with F30066 if they are in the liver. Rabbits were inoculated with 248-252 cercariae of *Schistosoma japonicum*. They were sacrificed 7 to 8 weeks later. The results of this study indicate that a definite hapatic shift of the worms from the rectum and large intestine was observed and a few female worms were even killed in the liver. The dose of dipterex required for the hepatic shift by rectal administration is at least 2 or 5 times smaller than that by i.v. or p.o. dipterex, respectively Moreover, it is noted that dipterex per rectum produced

minimal or no side effects either systemically or in the digestive tract. It is suggested that this new approach in experimental chemotherapy might prove useful in the clinical treatment of human schistosomiasis.

75-3063. Johnson, M. K. (Biochem. Mechanisms Sect., MRC Toxicol. Res. Unit, Med. Res. Council Labs., Carshalton, Surrey, England). **The delayed neuropathy caused by some organophosphorus esters: mechanisms and challenge.** *Crit. Rev. Toxicol.* 3(3): 289-316; 1975. (131 references)

The manner in which a toxic chemical is to be handled may be deduced from observations made in wide-ranging toxicity tests on animals or from cases of intoxication appearing in people exposed to the chemical. This critical review of the neuropathy caused by organophosphorus esters considers the following points: characteristics of delayed neurotoxicity; early studies into the mechanism of such toxicity; current mechanistic studies including inhibition of esterases by organophosphorus esters, sites of action of neurotoxic organophosphates, and the function of the phosphorylation site; the interpretation of neurotoxicity tests including test procedure, assays of neurotoxic esterases, structure/activity relationships, and dose/response relationship;the problems of species differences including discussions of human sensitivity; chronic toxicity, potentiation, prevention, and therapy; and the unknown events following enzyme inhibition and aging, improved methods of biochemical monitoring, and improved methods of neurotoxicity testing.

75-3064. Strohmayer, A.; Desi, I.; Erdos, G.; Dura, G.; Gonczi, C.; Kneffel, Z. (National Inst. Public Health, Budapest, Hungary). **Fundazol 50 WP fungicid komplex toxikologiai vizsgalata allatkiserletekben. [Complex toxicological investigation of Fundazol 50 WP (benomyl) fungicide in animal experiments.]** *Egeszsegtudomany* 19(2): 168-181; 1975. (18 references) (Hungarian)

A complex toxicological study of Fundazol 50 WP (containing 50% benomyl) is presented. The LD50 was determined as about 10,000 mg/kg in rats. White male CFY rats fed benomyl doses of 500 and 250 mg/kg daily for up to 90 days showed no significant changes in the resting ECG, electromyographic, and psychophysiological (maze) tests, but light flash stress at a frequency of 15 cps caused significant changes in the brain electrical activity in the group fed 500 mg/kg doses. There were no significant changes in the body weight, and insignificant increases in the liver weight were observed. Significant reduction of cholinesterase activity was found only in the liver tissue of rats fed 500 mg/kg doses. Experiments with monkey kidney tissue cultures revealed the harmlessness of concentrations below 250 ppm, strong growth inhibition effects at 300 ppm concentration, and pronounced toxic effects at 400 ppm. The LC100 for guppy and *Daphnia magna* was determined as 10 mg/l, while 1 mg/l proved to be ineffective.

75-3065. Vajda, A.; Schmid, H.; Groll-Knapp, E.; Haider, M. (Author address not given). **EEG changes and changes in evoked potentials caused by insecticides.** *Electroencephalogr. Clin. Neurophysiol.* 37(4): 442; 1974.

The effects of parathion (2.5 or 3.5 mg/kg) on electrical brain activity and evoked potentials in rats were studied. EEGs were initially recorded one week after epidural implantation of gold electrodes. Parathion was administered via an esophageal catheter. The EEG was recorded 1.5 hr after administration of the pesticide. The frequencies and the evoked potentials were analyzed by computer. At 21 hr after administration and 1 week later, these studies were again performed. Parathion damped all EEG frequencies. Visual and acoustic evoked potentials showed a reduction of amplitude and a small increase in latency of the first negative peak after the intoxication. The degree of change was dose-dependent. These effects were still present one week later. From the results of this study it is concluded that the possibility of long-term injury and initial damage must be taken into account in the use of parathion.

75-3066. Del Fosse, E. S.; Balsbaugh, E. U., Jr. (Entomol.-Zool. Dep., South Dakota State Univ., Brookings, SD 57006). **Effects of ULV organophosphates on horn flies and face flies of cattle and on the bovine coprocoenosis.** *Environ. Entomol.* 3(6): 919-922; 1974. (9 references)

A study in east-central South Dakota during the summers of 1971 and 1972 evaluated insecticidal control of horn and face flies (*Haematobia irritans* (L.) and *Musca autummalis* De Geer, respectively) on cattle, as well as potential side effects to the insects of the bovine coprocoenosis. Three organophosphate compounds were aerially applied in ULV formulations: Ravap, a 1:4 mixture of dichlorvos and Rabon (tetrachlorvinphos); Rabon; and malathion. All 3 insecticides reduced the number of adult flies of both species for at least 1 day but for less than 1 wk. No residual control was noted. No significant effects to the dung biota could be attributed to Ravap or malathion. Rabon significantly ($P = 0.01$) diminished only numbers of *Platystethus americanus* Erichson, *Falagria dissecta* (Erichson), *Aphodius fimetarius* (L.), and *Cercyon pygmaeus* Illiger, and, to a lesser degree ($P = 0.05$), a miscellaneous group of unidentified dipterous larvae and larval hydrophilids. Most of the dung fauna, however, were unaffected by the insecticides. (Author abstract by permission)

75-3067. Balba, M. H.; Saha, J. G. (Chem. Biol. Res. Inst., Res. Branch Agric. Canada, Ottawa, Ontario, Canada). **Metabolism of lindane-^{14}C by wheat plants grown from treated seed.** *Environ. Lett.* 7(3): 181-194; 1974. (15 references)

About 41 g of Canthatch wheat seed were treated with 480 ppm lindane-^{14}C, and the treated seed was planted in a field of medium to heavy textured soil of a silty glacial lake deposit. About 60 g of wheat seedling plants were collected at random from the field 19 days after the seeds

were planted. Mature wheat plants were harvested 100 days after seeding. Significant amounts of ^{14}C-labeled residues were present in the seedlings and in the mature wheat plants, indicating that lindane and/or its degradation products are readily translocated into the growing plants. The wheat seedlings had 0.55 ppm (as lindane) of total ^{14}C-labeled residues. In mature plants the highest levels of residues were in the roots (2.29 ppm), followed by straw (0.11 ppm), chaff (0.02 ppm), and no detectable radioactivity in the grain. Extraction of the plant tissues with methanol recovered more ^{14}C-labeled residues from the seedlings than from any part of the mature plant, indicating that the residues are more strongly bound in the mature plant tissues. Several metabolites were identified from the roots. These were *m*- and/or *p*-dichlorobenzene; 1,3,5-, 1,2,4-, and 1,2,3-trichlorobenzene; 1,2,3,4-tetrachlorobenzene; 1,2,4,5- and/or 1,2,3,5-tetrachlorobenzene; γ-PCCH; and pentachlorobenzene. Several chlorophenols were also indicated by TLC analysis. Chlorobenzenes and chlorophenols were also detected in other tissues. This study suggests that the metabolism of lindane by wheat plants is as complex as that by insects and mammals, and that similar metabolites are formed in all cases.

75-3068. Nicholson, S. A.; Clerman, R. J. (Dep. Biol., State Univ. Coll., Fredonia, NY 14063). **Toxicity of diquat to the crustacean amphipod *Hyalella* from Chautauqua Lake.** *Environ. Lett.* 7(3): 215-227;

The sensitivity of *Hyalella* from Chautauqua Lake to diquat was determined under standard laboratory condition. The test concentrations of diquat used ranged from 0.30 to 4.02 ppm (cation). Low diquat concentrations of 1.00 ppm (0.54 cation) or less reduced survival of test animals. Mean 24 hr survival rate was 35% at 1.50 ppm (0.80 ppm cation), 60% at 1.00 ppm (0.54 ppm cation), and 93% in controls. It was noted that the contrasts in survival rates of treated and untreated groups were accentuated with time. Over long periods, survival was decreased even at the lowest concentrations tested. The results of these tests confirm that, under laboratory conditions, *Hyalella* is killed by diquat levels commonly used for weed control. It is noted, however, that laboratory results are not necessarily directly applicable to field conditions. It is suggested that the marked decline in numbers of *Hyalella sp* in. Chautauqua Lake over the past few decades could be related to its extreme sensitivity to herbicides such as diquat—not only via direct toxicity, but also through indirect effects such as habitat destruction and food chain contamination.

75-3069. Saha, J. G.; Lee, Y. W. (Chem. Biol. Res. Inst. Agric. Canada, Ottawa, Ontario, Canada). **Degradation of lindane-^{14}C by wheat grain.** *Environ. Lett.* 7(4): 359-366; 1974. (13 references)

The degradation of lindane in wheat grain stored under laboratory conditions was studied. Wheat grains (200 g/treatment) were treated with various amounts of lindane-^{14}C in pentane solution, with pentane concentrations of about 10 to over 400 ppm. Some grain was stored dry for 148 days at room temperature. Other grain samples were stored after 10% water (w/w) had been added to their storage containers. The addition of the water was intended to increase enzyme activity, as cereal grains remain relatively dormant at low moisture content. An additional sample was stored at a higher temperature of 32.2°C with the intention of increasing the velocity of any enzymic degradation of lindane. Regardless of moisture, temperature, or treatment level, similar results were obtained for all experiments. Very little volatile degradation product was formed from lindane-^{14}C in the treated grain. About 85 to 99% of the radioactivity present in the treated grain could be extracted with ether. Nearly all the extractable residues were present as lindane (98-99%) and small amounts (1-2%) as α-PCCH indicating little degradation of lindane in the stored grain.

75-3070. Roberts, D. (Dep. Zool., The Queen's Univ., Belfast, Northern Ireland). **The effect of pesticides on byssus formation in the common mussel, *Mytilus edulis*.** *Environ. Pollut.* 8(4): 241-254; 1975. (18 references)

Seed mussels (*Mytilus edulis*) were exposed to endosulfan, aroclor 1242, aroclor 1254, DDT, carbaryl, and trichlorfon. Over 5000 animals were used in these studies. Several of the pesticides and PCBs tested caused a reduction in byssal attachment at higher concentrations. Byssus formation was similarly affected in queen scallops (*Chlamys opercularis*) although this species was more sensitive than *M. edulis*. The sensitivity of mussels appeared greater at higher temperatures and decreased with increases in size. Endosulfan was the most toxic of the compounds tested. It caused a 50% reduction in byssal attachment after 24 hr at 0.45 mg/l. The least toxic was trichlorfon which did not affect byssal attachment at concentrations up to 30 mg/l. It is suggested that the probable cause of decreased byssal attachment is a reduction in pedal activity. However, it is possible that direct interference with the synthesis or combination of byssus components may be involved. The byssogenesis tests may offer a rapid and convenient test for the routine screening of potential marine pollutants.

75-3071. Leffler, C. W. (Dep. Zool., Univ. Florida, Gainesville, FL 32611). **Effects of ingested mirex and DDT on juvenile *Callinectes sapidus* Rathbun.** *Environ. Pollut.* 8(4): 283-300; 1975.

In studies of the effects of ingested DDT and mirex on juvenile blue crabs (*Callinectes sapidus* Rathbun), mirex proved to be a much more potent stomach poison than DDT. Pronounced metabolic rate elevations were caused by high, subacute internal levels of mirex (0.02-0.2 ppm) and DDT (0.8 ppm). The autotomy reflex was inhibited by mirex internal concentrations of 0.02 ppm and above. An apparent decrease in carapace thicknesses rela-

tive to their widths may result from high internal levels of mirex during carapace formation following a moult. Osmotic and ionic regulation by juvenile blue crabs is not affected by subacute levels of DDT and mirex. Considering the concentration of contaminants in the food chain of aquatic animals, it is noted that the food of scavengers and predators would contain DDT family and mirex concentrations far above those in the surrounding water. Thus it is concluded that the possibilities of ingested chlorinated hydrocarbon pesticides resulting in outright poisoning, metabolic rate elevations, decreased muscular coordination, inhibition of the autotomy reflex, and reduced carapace thickness-width ratio leave little doubt that chlorinated hydrocarbon compounds are potentially disastrous agents with respect to blue crab populations. Mirex, at least with respect to crustaceans, is far more hazardous than DDT.

75-3072. Froslie, A. (Natl. Vet. Inst., Oslo, Norway). **Effects following intra-ruminal administration of DNOC and DNBP to sheep.** *Acta Vet. Scand. Suppl.* 49: 1-61; 1974. (42 references)

DNOC (about 70 mg/kg) and DNBP (about 45 mg/kg) were given orally to Norwegian mixed breed sheep and the clinical effects studied. The nine animals in the DNOC group showed significant dyspnea and hyperthermia during the acute stage; there was also a considerable degree of hemoconcentration and a moderate methemoglobinemia during this stage. There were toxic effects on the liver and kidneys as reflected by the plasma GOT and NPN levels. Only three animals survived and all suffered an extensive hemolysis followed by anemia. The clinical picture was similar in the DNBP groups, but the effects tended to be more pronounced despite the lower dosage. The initial effects of DNOC and DNBP were caused by the unmetabolized dinitrophenols and by the diamino metabolites produced in the rumen. The delayed effects were caused by the diamino metabolites alone. The results confirmed that oral DNBP is more toxic to ruminants than oral DNOC.

75-3073. Pekas, J. C. (Metabolism Radiat. Res. Lab., USDA, ARS, Fargo, ND 58102). **Gastro-intestinal absorption and toxicology: ingesta-exchange and simulated-meal techniques.** *Food Cosmet. Toxicol.* 12(3): 351-357; 1974. (11 references)

The homologous incorporation of a test substrate into ingesta recovered from donor animals and subsequent administration of the mixture to recipient animals makes up the ingesta-exchange technique. The incorporation of a test substrate into semi-liquid preparations of normal diets is called the simulated-meal technique. The combination of these techniques overcomes many limitations of conventional oral dosing of animals with mg quantities of synthetic non-nutritive substances. These techniques are especially useful if the substances are lipophilic and have high toxicity or biological activity. Time-course studies and studies involving non-absorbable markers are especially helped by these techniques. Equipment for the extrusion of semi-solid donor gastric ingesta or simulated meals is described. The absorption of a lipophilic carbamate was slower and more delayed after an ingesta-exchange dose than after a conventional dose given by esophageal cannula, while the extrent of metabolism was apparently greater after the ingesta-exchange dose.

75-3074. Pelissier, M. A.; Machon, P.; Atteba, S.; Albrecht, R. (Lab. Biol., Conservatoire Natl. Arts et Metiers et Inst. Sci., Tech. Aliment., Paris, France). **Quelques effets a moyen terme du lindane sur les enzymes microsomales du foie chez le rat.** [**Some effects of short-term lindane application on microsomal enzymes of rat kidney.**] *Food Cosmet. Toxicol.* 13(4): 437-440; 1975. (21 references) (French)

The activities of several microsomal enzymes have been determined in male rats fed a diet containing 120 or 240 ppm lindane for 4 or 8 wk. The substrates were of type I or II, water- or liposoluble, undergoing oxidation or reduction. Lindane acted as an inducer of these enzymes and it was shown that the development and extent of the induction during the treatment period varied with the substrate used. These enzymatic changes were associated with increases in the weights of the liver and kidneys and may have been a reflection of a detoxication mechanism. (Author abstract by permission)

75-3075. Bringmann, G.; Kuehn, R. (Author address not given). **Wirkung herbizider Phenylharnstoff-Derivate gegen Blaualgen (Modellorganismen: *Microcystis aeruginosa* bzw. *Nostoc* spec.).** [**Effect of herbicidal phenylurea derivatives on blue algae (model organisms: *Microcystis aeruginosa* and *Nostoc* sp.).**] *Gas- Wasserfach Wasser Abwasser* 116(8): 366-369; 1975. (German)

The effects of phenylurea-derived herbicides (diuron, chlorbromuron, neburon, chloroxuron, monuron, fluometuron, benzthiazuron, metobromuron, monolinuron, buturon, and cycluron) on *Microcystis aeruginosa* and *Nostoc* sp. were studied and compared with those on *Scenedesmus quadricauda*. Phenylurea derivatives with dichlorophenyl, bromochlorophenyl, and chlorophenoxyphenyl components were found to be the most powerful proliferation inhibitors, while the herbicide with the cycloctyl component showed the weakest inhibitory effect. Among the herbicides with chlorophenyl components, dimethylurea derivatives were more toxic than methoxymethylurea and methylisobutinyl derivatives. The herbicide concentrations at which inhibition started were lowest for *Microcystis aeruginosa*, and highest for *Nostoc* sp., which latter was stimulated by subthreshold concentrations. Regarding susceptibility, *Scenedesmus quadricauda* assumed an intermediate position between the two species studied. The findings indicate that *M. aeruginosa* is especially suitable as a model organism for

the determination of the lowest inhibiting concentration of phenylurea-derived herbicides.

75-3076. Bolotnyy, A. V. (Inst. Hyg. Toxicology Pesticides, Polymers, and Plastics, Kiev, USSR). **Materialy k gigienicheskomu normirovaniyu novogo fosfororganicheskogo insektitsida gardony v vozdukhe rabochey zony. [Data for the hygienic standardization of the new organophosphorus insecticide gardona in workplace air.]** *Gig. Tr. Prof. Zabol.* 4: 50-51; 1975. (4 references) (Russian)

The oral, inhalatory, and cutaneous toxicity of the organophosphorus insecticide gardona (tetrachlorvinphos) was studied in animal tests. The acute oral toxicity was determined to be 1865 mg/kg in mice and 2955 mg/kg in rats. A single 2500 mg/kg dose applied to the skin of rabbits and rats caused no poisoning, apart from a reduction of the cholinesterase activity. Rats, mice, cats and rabbits survived 4-hr exposure to gardona in a concentration of 280 mg/m^3 in the air. The acute threshold concentration in the air was determined to be 38 mg/m^3. Weak cumulative effect was observed in a 4-month oral poisoning test. Gardona was toxic when inhaled in 9.2 mg/m^3 concentration for 4 months, while a lower concentration of 1.9 mg/m^3, causing a single drop in the cholinesterase activity, can be regarded as a subthreshold concentration. The maximum allowable concentration in the air is recommended to be set at 1 mg/m^3.

75-3077. Kozaczenke, J. (Polish Gynecol. Clin., Central Hosp. Clin., Acad. Med., Warsaw, Poland). **Badania doswiadczalne wplywu subtoksycznych dawek dipteréksu i metasystoksu na ciezarne, zarodki i losy plodow. [Preliminary studies of the effect of subtoxic doses of dipterex and metasystox on pregnancy, the fetus, and the fetal risk.]** *Ginekol. Pol.* 46(4): 451-454; 1975. (Polish)

Effects of subtoxic doses of dipterex and metasystox on pregnancy and fetal risk were evaluated by using chicken eggs, pregnant female rats, and rabbits. Toxic effects in fertilized eggs gradually reached 100% during the first 1-18 days of incubation after injection of 3.2 mg of dipterex and 4 mg of metasystox per egg. Both substances have little effect on weight increase, duration of pregnancy, or size of litter of the test animals. A 100% fetus mortality was achieved with muscular injections of 20% of LD50 of both substances administered daily throughout pregnancy. Activity of cholinesterases was decreased by 3-4 times in pregnant females and by 40% in surviving litters; this lasted 3-4 weeks after birth.

75-3078. Kihlstrom, J. E.; Orberg, J.; Lundberg, C.; Danielsson, P. O. (Inst. Zoophysiol., Box 560, S0751 22 Uppsala, Sweden). **Post-natal growth in mice sucking milk containing PCB or DDT.** *Ambio* 3(6): 231-233; 1974. (18 references)

This paper describes growth rates of young mice nursed by mothers given PCB or DDT in amounts resulting in residue levels closely corresponding to those found in nature. Thirty pregnant mice of the NMRI strain were used in the experiment. On the day of parturition, 10 mice were injected with 50 mg PCB/kg, 10 received 50 mg DDT/kg, and the remaining animals received the corresponding volume of the peanut oil vehicle. The s.c. injections were continued once weekly until each animal received about 5 mg total of the drug. The young were removed from the mothers at 21 days of age. The animals nursed by PCB-treated mothers grew significantly faster from day 17 onwards, as was also true of controls, but the difference in the exposed mice was less significant as they had grown faster than controls in the period prior to day 17. PCB-treated males grew faster than their female littermates, as was also true for controls. The young mice exposed to DDT also demonstrated increased growth rates after day 17. However, this difference was less pronounced than in the PCB-treated animals due to a significantly slower growth than that of the controls from day 17 on. At the time of weaning the drug-exposed animals were significantly heavier than their controls. However, by day 33 this difference was no longer visible. It is suggested that the rapid growth of the exposed young may be due to the well-known stimulating activity of PCB and DDT on hepatic hydroxylases and other enzymes which may lead to a general increase of the metabolic activity. A second explanation is that the experimental mothers may produce more milk than the controls, which would also explain why the weight difference between experimental and control mice disappears some time after weaning.

75-3079. Huelse, M.; Harbauer, G. (Univ. HNO Klin., Hamburg, Germany). **Cochleovestibular disturbances in alkylphosphate intoxication, as shown in animal experiments and clinical observations.** *Int. Arch. Occup. Environ. Health* 35(2): 133-144; 1975. (29 references)

Cochleovestibular disturbances after alkylphosphate intoxication were investigated in 10 rabbits. Each rabbit received 1.09 mg mevinphos (0.36 mg/kg) as an i.v. drip over 30 min. Central vestibular excitation was noted in 9 of the 10 animals. The case reports are presented of 2 patients, aged 41 and 44 yr, with otological symptoms after alkylphosphate poisoning. In both cases central vestibular disturbances were noted. Although the subjective symptoms disappeared, there was no remission of the spontaneous nystagmus, especially in the older patient. The equilibrium disturbances remained demonstrable, whereas the cholinesterase returned to normal. These findings support conclusions from earlier studies. In contrast to earlier studies, however, no evidence of hearing defects nor tinnitus were found. It is concluded that cochleovestibular damage has to be expected after exposure of more than 5 yr. When considering medical and legal aspects of occupational diseases, it must be remembered that the cochleovestibular disturbances are a sequela of chronic alkylphosphate intoxication.

75-3080. Forgash, A. J.; Ahmad, S. (Dep. Entomol., Rutgers, The State University, New Brunswick, NJ 08903). **Hydroxylation and demethylation by gut microsomes of gypsy moth larvae.** *Int. J. Biochem.* 5(1): 11-15; 1974. (15 references)

The effects of larval microsomal enzyme preparations are reported on certain classical biotransformations important in the detoxication of many insecticides, i.e., hydroxylation and *N*- and *O*-demethylation. The larvae used were from the gypsy moth *Porthetria dispar* L. The specific activity for hydroxylation (aniline) was 11.3 nmoles product/hr. The corresponding figure for *N*-demethylation (*N*,*N*-dimethyl-*p*-nitrophenyl carbamate) was 8.0; for *O*-demethylation (*p*-nitroanisole), 7.0. Bovine serum albumin enhanced these rates by 11.9, 50.9, and 24.5%, respectively, thus indicating the presence of some inhibitory materials in the microsomal preparation. *N*-demethylase activity was maximal at 37°C, declining rapidly at higher temperatures, probably through thermal deactivation. The highest observed activity was between pH 7.0 and 7.8. The mixed-function oxidase inhibitor, SKF 525-A, inhibited all 3 reactions. Adding Mg^{2+} did not improve enzymatic activity.

75-3081. Krupka, R. M.; Hastings, F. L.; Main, A. R.; Iverson, F. (Res. Inst. Agric. Canada, London, Ontario, Canada). **Nitrophenyl acetate hydrolysis by acetylcholinesterase. A correction.** *J. Agric. Food Chem.* 22(6): 1150; 1974. (5 references)

The values previously reported for the rate of hydrolysis of *o*-nitrophenyl acetate by bovine erythrocyte acetylcholinesterase have been corrected. The numerical value of *V*max for *o*-nitrophenylacetate given in an earlier paper is in disagreement with experimental data shown in that same paper. Recalculation of *V*max from the correct data gives a figure close to that for acetylcholine, 22.7 compared to 19.4 μmol/min/ml. Accordingly, for each mole of *o*-nitrophenyl acetate hydrolyzed, 1.65 mol of acid should be released at pH 7.5, i.e., 1 mol from acetic acid and 0.65 mol from the partial ionization of *o*-nitrophenol. The expectation that no acetyl ester substrate should be found with a significantly higher *V*-max than acetylcholine is thus vindicated.

75-3082. Nelson, J. O.; Matsumura, F. (Dep. Entomol., Univ. Maryland, College Park, MD 20742). **Separation and comparative toxicity of toxaphene components.** *J. Agric. Food Chem.* 23(5): 984-990; 1975. (12 references)

Components and fractions of toxaphene have been separated by a combination of methods including Sephadex LH-20-methanol column chromatography, thin-layer chromatography, reverse phase thin-layer chromatography, and preparative gas chromatography. Fractions separated by the above methods show varying toxicities to three aquatic organisms, a blue-green alga, brine shrimp, and mosquito larvae. Employing a combination of preparative TLC and GC methods, a toxic fraction of toxaphene 1.87, 1.75, and 1.35 times more toxic than toxaphene to mosquito larvae, brine shrimp, and algae, respectively, has been isolated. The fraction, though it behaves as a single component in various chromatographic systems, was found to consist of two components on the basis of nuclear magnetic resonance (NMR) spectroscopy. They were partially characterized by infrared and mass spectrometry as octachlorobornanes. (Author abstract reprinted by permission of the American Chemical Society)

75-3083. Turner, W. V.; Khalifa, S.; Casida, J. E. (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Toxaphene toxicant A. Mixture of 2,2,5-*endo*,6-*exo*,8,8,9,10-octachlorobornane and 2,2,5-*endo*, 6-*exo*, 8,9,9,10-octachlorobornane.** *J. Agric. Food Chem.* 23(5): 991-994; 1975. (9 references)

Two materials, toxicants A and B, account for a significant portion of the toxicity of technical toxaphene to mice, goldfish, and houseflies. The more toxic one, toxicant A, is identified by ^1H NMR studies as a mixture of 2,2,5-*endo*, 6-*exo*,8,8,9,10-octachlorobornane and 2,2,5-*endo*, 6-*exo*,8,9,9,10-octachlorobornane. These components have many structural feactures in common with the previously identified toxicant B, 2,2,5,-*endo*, 6-*exo*,8,9,10-heptachlorobornane. (Author abstract reprinted by permission of the American Chemical Society)

75-3084. Reif, V. D.; Littleton, B. C.; Sinsheimer, J. E. (Coll. Pharm., Univ. Michigan, Ann Arbor, MI 48104). **In vitro biotransformations of 1-(*o*-chlorophenyl) -1- (*p*-chlorophenyl) -2,2- dichloroethane (*o*,*p*'-DDD) and 1,1-bis (*p*-chlorophenyl) -2,2- dichloroethane (*p*,*p*'-DDD) by bovine adrenal.** *J. Agric. Food Chem.* 23(5): 996-999; 1975. (25 references)

In vitro biotransformations of ^{14}C-labeled 1-(*o*-chlorophenyl) -1- (*p*-chlorophenyl) -2,2- dichloroethane (*o*,*p*'-DDD) and 1,1-bis (*p*-chlorophenyl) -2,2-dichloroethane (*p*,*p*'-DDD) by bovine adrenal homogenates were studied. Homogenates were found to oxidize *o*,*p*'-DDD to *o*,*p*'-dichlorodiphenylacetic acid (*o*,*p*'-DDA), while *p*,*p*'-DDD was converted to bis(*p*-chlorophenyl)acetic acid (*p*,*p*'-DDA) and 1,1-bis(*p*-chlorophenyl)-2,2-dichloroethanol. Transformation products were identified by thin-layer chromatography and mass spectra of band extracts. The mitochondrial fraction was found to be the most active of the cortex subcellular fractions in transforming the substrates with some contribution by the soluble fraction. Transformation of the microsomal fraction was negligible. An NADPH generating system was necessary for these transformations, and they did not occur with boiled enzyme preparations. (Author abstract reprinted by permission of the American Chemical Society)

75-3085. Osorio, R. G.; Isaza-Cadavid, J.; Cordoba, D.; Cordoba, E. H.; Lopez, D.; Garcia, S. (Toxicol. Inform.

Cent., Univ. Antioquia Sch. Med., Medellin, Colombia). **Efecto protector de algunas aminas frente a distintos toxicos. [Protective action of certain amines against various poisons.]** *Antioquia Med.* 23(3-4): 195-207; 1973. (Spanish)

After the accidental discovery in 1968 that diphenhydramine could be used to treat organophosphate poisoning in humans, the authors conducted an experiment with 10 dogs to discover if another antihistamine (clemastine) would have the same action. The dogs were anesthetized and poisoned with DDVP (dichlorvos), then treated either with diphenhydramine or with cleastmine. From the failure of the latter to combat the anticholinesterase action of the organophosphate, it was concluded that the pyrrolidone radical of the clemastine molecule does not have the same action as the tertiary amine radical of the diphenhydramine. Thus the only antihistamines that would seem capable of antidotal action against organophosphate poisoning would be the ethylenediamines, the ethanolamines, and the propylamines.

75-3086. Stahl, P.; Mandell, B.; Rodman, J. S.; Schlesinger, P.; Lang, S. (Washington Univ. Med. Sch., St. Louis, MO 63110). **Different forms of rat β-glucuronidase with rapid and slow clearance following intravenous injection: selective serum enhancement of slow clearance forms by organophosphate compounds.** *Arch. Biochem. Biophys.* 170(2): 536-546; 1975. (21 references)

In this report, two types of rat β-glucuronidase were resolved on the basis of clearance experiments employing i.v. injections of purified enzyme preparations. Paraoxon and diisopropylfluorophosphate (DFP) are potent insecticides whose toxicity is related to the inhibition of serine proteases and cholinesterase. These 2 insecticides elicit a massive, selective increase in serum β-glucuronidase, but not other lysosomal enzymes. Atropine does not block this response, nor is it mimicked by neostigmine or carbachol. Therefore, it is not cholinergically mediated. Evisceration of the liver abolishes the response, suggesting a role for liver in mediating the organophosphate effect. The β-glucuronidase isolated from sera of organophosphate treated rats by affinity chromatography is catalytically similar to rat liver β-glucuronidase while having a lower isoelectric point. After i.v. injection, purified rat liver microsomal and lysosomal β-glucuronidase were cleared rapidly from the circulation. β-Glucuronidase isolated from sera of organophosphate-treated rats cleared much more slowly. Evisceration of the liver severely reduced the clearance of all enzyme preparations. Competition experiments with asialofetuin and asialoorosomucoid suggest that the liver receptors for asialoglycoproteins do not mediate clearance of β-glucuronidase.

75-3087. Huddart, H.; Greenwood, M.; Williams, A. J. (Dep. Biol. Sci., Univ. Lancaster, Lancaster, England). **The effect of some organophosphorous and organochlorine compounds on calcium uptake by sarcoplasmic reticulum isolated from insect and crustacean skeletal muscle.** *J. Comp. Physiol.* 93(2): 139-150; 1974. (22 references)

The results are presented of in vitro experiments on isolated sarcoplasmic reticulum (SR) designed to test the possibility that organophosphorus and organochlorine insecticides may exert their main contracture-inducing effect by altering not only the structure but also the calcium accumulating ability of the SR in arthropod skeletal muscle. Mitochondrial-free SR was isolated from crab and cockroach skeletal muscle. SR calcium uptake was studied in control and insecticide-treated conditions. Incubation was carried out in Ca^{45} media followed by millipore filtration. Liquid scintillation counting methods were used. Parathion, DDT, γ-BHC, and tri-*O*-cresyl phosphate were the insecticides used. At 1 m*M* concentrations all caused a slight fall in the intrinsic Ca^{2+} content of the SR. However, this loss was not sufficient to explain the contracture induction effect these agents reveal. At 1 m*M*, these insecticides caused massive inhibition of SR Ca^{2+} uptake. All were able to release Ca^{2+} previously bound to the SR during incubation in the presence of ATP. The results of these experiments allow the conclusion that the contracture-inducing effect of these insecticides is due to their inhibition of SR Ca^{2+} uptake, resulting in a massive rise in myoplasmic free Ca^{2+}.

75-3088. Cripps, R. E. (Shell Res. Ltd., Woodstock Lab., Sittingbourne, Kent, England). **The microbial metabolism of acetophenone. Metabolism of acetophenone and some chloroacetophenones by an *Arthrobacter* species.** *Biochem. J.* 152: 233-241; 1975. (35 references)

An organism that utilizes acetophenone as sole source of carbon and energy was isolated in pure culture and tentatively identified as an *Arthrobacter* sp. Cell-free extracts of the acetophenone-grown organism contained an enzyme, acetophenone oxygenase, that catalyzed an NADPH-dependent consumption of O_2 in the presence of the growth substrate; approx. 1 mol of O_2 and 1 mol of NADPH were consumed per mol of acetophenone oxidized. Cell-free extracts also contained an enzyme capable of the hydrolysis of phenyl acetate to phenol and acetate. The amount of this esterase was increased markedly by growth on acetophenone. The observed products of the acetophenone oxygenase reaction by crude cell-free extracts were phenol and acetate. However, inhibition of the phenyl acetate esterase by paraoxon resulted in the formation of phenyl acetate from acetophenone. A degradative sequence is proposed in which acetophenone is metabolized by an oxygen-insertion reaction to form phenyl acetate. Further metabolism occurs by hydrolysis of this ester. The organism and extracts were shown to metabolize chlorinated acetophenones. The environmental implications of this observation are discussed. Chlorinated acetophenones are formed by degradation of chlorfenvinphos and related compounds. (Author abstract by permission)

75-3089. Pequignot, J.; Labat, R.; Chatelet, A.; Moga, A. (Lab. Anim. Ecophysiol., Paul-Sabatier Univ., Toulouse, France). **Action du sulfate de cuivre sur les cellules a mucus de l'alevin de truite (*Salmo irideus*).** [**Action of copper sulfate on mucous epithelium cells in rainbow trout (*Salmo irideus*).**] *J. Eur. Toxicol.* 8(1): 52-56; 1975. (10 references) (French)

The effect of copper sulfate on the integument and on the gastric and intestinal mucosa of 2-month-old rainbow trout (*Salmo irideus*) was studied by staining with *p*-aminosalicylic acid-hematoxylin or hematoxylin-alcian blue. The animals were kept in water containing 0.25 ppm copper sulfate for 48 hr, or 0.1 ppm copper sulfate for 96 or 240 hr. Another group was poisoned by food containing copper sulfate. Progressive reduction in the number of stainable mucus cells with the advancement of the exposure was observed in the integument and in the intestinal mucosa, which is indicative of a reduction in the rate of mucus secretion. The mucus secretion was totally suppressed by the 10th day of exposure. Increased mucus secretion was found in the gastric mucous epithelium. The reduction in the number of stainable mucus cells appears to be characteristic for poisoning with copper sulfate in fish.

75-3090. Benes, V.; Sram, R. J.; Tuscany, R. (Inst. Hyg. Epidemiol., Prague, Czechoslovakia). **Fenitrothion. I. Study of mutagenic activity in rats.** *J. Hyg. Epidemiol. Microbiol. Immunol.* 19(2): 163-172; 1975. (9 references)

Fenitrothion was administered at 0, 10, 40, or 80 ppm in the diet to Wistar strain rats. Dominant lethal mutations were studied by their tentative determination in single mating in P - to F_3 generation males and females 200 days after exposure, and by assessing the effect of the agent at various stages of spermatogenesis with F_2 and F_4 generation males having been exposed 100 days and mated to unexposed females for 10 weeks. In the bone marrow of F_2 generation males following 200 days of exposure and F_3 generation males following 500 days of exposure to a dose of 80 ppm, analysis of chromosome aberrations was made. All experiments yielded negative results concerning both the dose and generation. Hence fenitrothion is not considered to be a substance with mutagenic activity. It is suggested that the proposed combination of reproduction and mutagenic-activity studies of an agent for toxicological evaluation has certain advantages.

75-3091. Armstrong, D. A.; Millemann, R. E. (Marine Science Center, Oregon State Univ., Newport, OR 97365). **Pathology of acute poisoning with the insecticide Sevin in the bent-nosed clam, *Macoma nasuta*.** *J. Invertebr. Pathol.* 24(2): 201-212; 1974. (18 references)

Toxicity tests over a 96 hr period were performed on adult bent-nosed clams, *Macoma nasuta*, using the insecticide Sevin (carbaryl) in concentrations of 15, 20, 25, and 30 mg/liter. Death was defined as the inability of clams to retract siphons or to close valves. About half of the "dead" clams were returned to clean sea water to determine if recovery would occur. No "dead" clams recovered within 96 hr after return to the clean water. The others were used in histopathology studies. Pathological changes consisted primarily of necrosis of epithelial tissue of the gill, mantle, siphon, and suprabranchial gland, and the severity of damage was directly related to the test concentrations. Vacuolization, rupture, and pycnosis of cells was noted. The most severely affected organs were the gills. As early as 24 hr after the beginning of exposure to Sevin, epithelial cells of the gill filaments bearing the frontal, laterofrontal, and lateral cilia were sloughed. Within 96 hr of exposure, about 50% of the exposed clams had lost one or both siphons and also the epithelia on still attached segments. That Sevin caused severe, superficial histological damage suggests that damage to the nervous system through cholinesterase inhibition may not be the only or even the primary cause of death of exposed clams. The pathology primarily responsible for death of the clams was probably gill necrosis. Necrosis and loss of epithelial surfaces on the siphon and mantle could provide portals of entry for disease agents. Loss of the inhalent siphon would impair food gathering and interfere with respiration. Damage to the suprabranchial gland could reduce feeding activity and cleaning of the gills and palps if mucus production were diminished.

75-3092. Gilliam, M.; Prest, D. S.; Morton, H. L. (Agric. Res. Serv., U.S. Dep. Agric., Tucson, AZ 85719). **Fungi isolated from honey bees, *Apis mellifera*, fed 2,4-D and antibiotics.** *J. Invertebr. Pathol.* 24(2): 213-217; 1974. (16 references)

A study was performed of the fungal flora from the intestinal contents of adult worker honey bees (excluding yeasts) from control colonies, from colonies fed 2,4-D, and from colonies fed a combination of oxytetracycline and fumagillin. Forty-six fungi belonging to 18 different species were isolated and identified from the 388 bees examined. Thirteen isolates were identified from controls, 4 from those fed 2,4-D, and 3 from those receiving antibiotics. Thus, bees fed 2,4-D or antibiotics had fewer fungi in their intestines. In a second study 11 isolates were from bees fed 2,4-D, 10 from controls and 5 from bees receiving antibiotics. *Penicillium cyclopium* was the most frequent isolate in the second test; *Aspergillus flavus*, in the first. However, *P. cyclopium* was the second most frequent isolate in the second test. The results of this study indicate that fungi, excluding yeast, are not prevalent in intestines of caged honey bees. Antibiotics appear to depress the fungal flora. None of the fungi isolated are symbiotes in the intestines of bees, as many bees contained no fungi in their guts. In this study only *Penicillium cyclopium* and *Alternaria tenuissima* were isolated fom control, antibiotic-fed, and herbicide-fed bees. *Aspergillus flavus*, *Rhizopus arrhizus*, and *P. corylophilum*, isolated only from control bees, may have been damaged in growth and survival by 2,4-D and the antibiotics. Antibiotics may have affected *P. frequentans*, *Cladosporium cladosporoides*, and *Aspergillus sydowi*. The herbicide, 2,4-D, may have affected favorably

the growth of *Curvularia brachyospora, Aspergillus niger, P. chrysogenum*, and *P. ochro-chloron*. The antibiotics may have a stimulating effect on *Aspergillus tereus, P. notatum, P. citrinum*, and *P. urticae*.

75-3093. Gilliam, M.; Wickerham, L. J.; Morton, H. L.; Martin, R. D. (Agric. Res. Serv., U. S. Dep. Agric., Tucson, AZ 85719). **Yeasts isolated from honey bees, *Apis mellifera*, fed 2,4-D and antibiotics.** *J. Invertebr. Pathol.* 24(3): 349-356; 1974. (24 references)

The yeast flora was examined in the intestinal contents of adult worker bees from caged colonies fed 2,4-D, a combination of Terramycin and Fumidal B (oxytetracycline and fumagillin, respectively), or untreated pollen patties. Yeasts belonging to seven species were isolated and identified from the 388 bees examined. *Torulopsis magnoliae, Candida parapsilosis*, and *T. glabrata* were found in bee guts most frequently. Yeasts were more prevalent than Enterobacteriaceae or fungi in caged bees fed 2,4-D, antibiotics, or pollen patties. Yeasts did not appear in bees' guts until the colonies had been caged and fed experimental diets for 30-40 days. Thus, the intestinal yeast flora of adult worker bees in Arizona appears to develop under conditions of stress such as caging of colonies, feeding artificial diets, or feeding 2,4-D to the colonies. Identification was made of 125 isolates from bees fed 2,4-D, 57 from control bees, and only 12 from bees fed antibiotics. The guts of bees from colonies treated with antibiotics contained few or no yeasts. The combination of oxytetracycline and fumagillin depressed not only the yeast flora but also the fungal and bacterial flora. It has been possible to eliminate all the microflora of adult worker bees by feeding caged colonies large amounts of these antibiotics over long periods. More guts of bees from colonies fed 2,4-D contained yeasts than those examined from bees in control colonies. Only *Torulopsis magnoliae* was isolated from control bees, bees fed 2,4-D, and bees fed antibiotics. *Torulopsis glabrata* and *Candida parapsilosis* were isolated from controls and from bees fed 2,4-D. Perhaps the antibiotics had a detrimental effect on the growth and survival of these organisms. *Hansenula anomala* was found in controls and in bees fed antibiotics. It is assumed that 2,4-D might have affected this organism.

75-3094. Jones, G. (MCR Toxicol. Unit., Med. Res. Council Labs., Carshalton, Surrey, England). **A histochemical study of the liver lesion induced by 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (dioxin) in rats.** *J. Pathol.* 116(2): 101-105; 1975. (15 references)

A histochemical study of membrane associated enzymes was undertaken to identify any impairment in function of the parenchymal cell plasma-membranes before morphological damage was evident. The examination revealed a significant lesion 3 days after a single oral dose of dioxin. Complete loss of canalicular ATPase reaction in the parenchymal cells of the centrilobular zone remained the prominent feature throughout the 6-wk study. Involvement of the periportal and midzonal regions occurred in moribund animals. An improvement in health of 2 surviving animals at 9 months' time was associated with a normal distribution of ATPase in the liver. Qualitative changes in 5-nucleotidase and acid phosphatase were secondary to the parenchymal cell damage. This study supports earlier evidence that the parenchymal cell plasma-membrane is a specific subcellular site for the toxic action of dioxin.

75-3095. Kiyono, S.; Hasui, K.; Takasu, K.; Seo, M. (Dep. Physiol., Inst. Develop. Res., Aichi Prefectural Colony, Kasugai, Aichi, Japan). **Toxic effect of arsenic trioxide in infant rats.** *J. Physiol. Soc. Jpn.* 36(7): 253-254; 1974. (5 references)

Sprague-Dawley rats were treated with arsenic trioxide at a dose of 5.0, 7.5, or 10.0 mg/kg once a day from the first day of life to weaning on day 21. No sex difference was noted in the lethality of treatment. Death occurred sporadically, but before weaning. In those receiving the 5.0 mg/kg doses 4 of 34 died (11.8%); in the 7.5 mg/kg group, 31 of 56 died (55.4%); and in the 10.0 mg/kg group, 89 of 101 died (88.1%). Arsenic lethality was dose dependent. The first fatal case occurred on day 6 in the 5.0 mg/kg group, day 5 in the 7.5 mg/kg group, and day 2 in the 10.0 mg/kg group. Arsenic trioxide depressed the increase of body weight in a strictly dose dependent manner. Spontaneous mobility tended to be increased by the treatment. In the 5.0 mg/kg group, only one animal showed a highly increased mobility. In the 7.5 mg/kg group, 4 of 18 showed a heightened mobility. Arsenic trioxide applied in infancy could have a long-lasting pathological after-effect in the rat.

75-3096. Maglothin, J. A.; Wilson, I. B. (Dep. Chem., Colorado, Boulder, CO 80302). **Equilibrium constants for the phosphorylation of acetylcholinesterase by some diethyl phosphorothiolates and phosphates.** *Biochemistry* 13(17): 3530-3537; 1974. (21 references)

A comparison was made of two classes of organophosphorus inhibitors of acetylcholinesterase, phosphorothiolates and phosphates. The comparison was made in terms of their reversible binding with the enzyme, phosphorylating activities, and free energies of hydrolysis. Comparable reversible binding affinities for eel acetylcholinesterase were displayed by *O,O*-diethyl *S*-[2-trimethylammonium)ethyl] phosphorothiolate iodide, *O,O*-diethylphosphorylcholine iodide, and *O,O*-diethyl *O*-[2-(dimethylammonium)ethyl] phosphate hydrogen oxalate, having dissociation constants ranging from 1 to 4 x 10^{-3}M. The dissociation constant for *O,O*-diethyl *O*-(3,3-dimethylbutyl)phosphate is somewhat greater, 1.1 x 10^{-2}M. The values of these dissociatin constants are consistent with current knowledge of the factors contributing to molecular complementarity in this system. The phosphorothiolates are potent phosphorylating agents. No such ability is detected for any phosphates after removing active

impurities by exposure to alkaline solution. The different phosphorylating activities of the phosphorothiolates as compared to the phosphates are in agreement with the large differences in the pKa's of their leaving groups. Rate constants were obtained for the reverse reaction. The pertinent equilibrium constants for phosphorylation and also the free energies of hydrolysis of the inhibitors were able to be calculated from the forward and reverse rate constants. Diethyl phosphorothiolates have free energies of hydrolysis of -23 kcal/mol at pH 7.0 and 25°. The comparable values for the diethyl phosphates are greater than or equal to -7. The phosphorothiolates are less stable than similar compounds having leaving groups with even lower p*K*a's. This finding suggests that it is appropriate to speak of these compounds as "high-energy compounds" or compounds with a high group transfer potential.

75-3097. Kossakowski, S. (Cent. Sci. Exper. Vet. Serv., Pulawy, Poland). **Mechanizm dzialania pestycydow fosforoorganicznych na organism zwierzecy. II. Reaktywacja cholinesteraz w zatruciach pestycydami fosforoorganicznymi. [Mechanism of action of organophosphorus pesticides on animals. II. Activation of cholinesterases in organophosphorus pesticide poisonings.].** *Med. Weter.* 30(9): 541-543; 1974. (60 references) (Polish)

Various substances are reviewed which are used in treatment of organophosphorus pesticide poisoning. These antidotes act to reactivate blood enzymes which have been blocked by a reversible reaction with organophosphorus compounds. Natural dephosphorylation processes are slow and ineffective against acute poisonings. Studies of the mechanism of inactivation of cholinesterases facilitated the discovery of direct-action antidotes. The half-life of some organophosphorus compounds has been shortened 300-500 times by administration of hydroxamic acids. A detailed description is given of the mechanism of action of Contrathion 2-PS and other oximes. Because of the two-stage process of cholinesterase inhibition by organophosphorus compounds, the effectiveness of antidotess is heavily dependent on the promptness of their administration (preferably less than 20 minutes after poisoning). One general inadequacy of most antidotes is the fact that they are eliminated too rapidly by living organisms.

75-3098. Lewerenz, H. J.; Engst, R. (Zentralinst. Ernaehrung, Akad. Wissenschaft. DDR, Potsdam-Rehbruecke, DDR). **Zur lebensmittelhygienisch-toxikologischen Beurteilung von Pflanzenschutzmitteln. [Evaluation of pesticides under the aspects of food hygiene and toxicology.]** *Nachrichtenbl. Pflanzenschutzdienst DDR* 29(6): 121-124; 1975. (German)

The complex procedure for food hygienic and toxicological assessment of plant protection agents is outlined. Pesticides are usually tested for toxicity in one rodent species, but the use of another nonrodent animal species is recommended. The toxicological tests encompass acute, subacute, and chronic toxicity; effects on reproduction over three generations; as well as teratogenic and mutagenic effects. The LD50 value and the no-effect level are determined. The latter is then used to determine the ineffective daily dose, from which the acceptable daily intake for man is calculated. Safety factors ranging from 10 to 1,000 (usually 100) are used in view of the species differences in susceptibility and effects and the amount of toxicological data available. The permissible residue level in the total diet is derived from the ADI values, and the legally permitted level in different kinds of food is then set below the permissible level.

75-3099. Rutschke, E.; Brozio, F. (Paedagogische Hochschule, "Karl Liebknecht" Sekt. Chem./Biol., Lehrstuhl Tierphysiol., Potsdam-Sanssouci, DDR). **Der Einfluss von Toxaphen auf die Leberparenchymzellen des Karpfen (*Cyprinus carpio* L.). [The influence of toxaphene on hepatic cells of the carp (*Cyprinus carpio* L.).]** *Biol. Zentralbl.* 94(4): 441-449; 1975. (19 references) (German)

Ultrastructural changes in the liver parenchyme cells of 2-yr-old carp (*Cyprinus carpio* L.) following exposure to 0.001-1 g mg/liter concentrations of toxaphene were studied. The changes, most distinct in the nuclei, mitochondria, and rough endoplasmic reticulum, were a function of concentration and exposure time, i.e., long-term exposure to low concentrations generated the same degree of alterations as did short-term exposure to high concentrations. Condensation of chromatic matter and its concentration near the membrane of the nuclei and the mucleolus, reduction of the electron density in the nucleoplasm, and separation of the nuclear membrane were observed. The mitochondria showed an initial swelling, condensation of the matrix, vacuolization, dissolution of the cristae, and rupture of the outer membrane. Increase of the membranes of the granular endoplasmatic reticulum, enclosure of the mitochondria by one or more layers of granular endoplasmic reticulum, and fragmentation of the membranes of the rough endoplasmic reticulum were found.

75-3100. Persson, B. (Dep. Animal. Ecol., Univ. Lund, Sweden). **Degradation and seasonal variation of DDT in whitethroats *Sylvia communis*.** *Oikos* 25(2): 216-221; 1974. (15 references)

The rate of degradation of *p,p'*-DDT and excretion of Σ-DDT in whitethroats *Sylvia communis* Lath, were studied in laboratory investigations. Each day, each bird was given one mealworm injected with 0.5 μl. After 12 days of feeding on DDT-injected mealworms, all birds were fed uncontaminated mealworms. Ten birds were sacrificed 10 days after the last DDT-injected mealworm and the remaining 11 birds were sacrificed an additional 10 days later. No significant differences were noted as far as the concentrations of Σ-DDT and its most common metabolite, *p,p'*-DDE, were concerned. However, *p,p'*-

DDT was degraded to a higher extent in the birds killed 20 days after administration of the last DDT-injected mealworm. This decrease in *p,p'*-DDT corresponded to the increase in *p,p'*-DDD. Whitethroats caught in the Spring at Ottenby had significantly higher concentrations of Σ-DDT and lindane than birds obtained at the same place in the autumn. This indicates that these substances are more widespread outside Sweden. After arriving in Sweden, the females transfer much of their organochlorine residues to the eggs. The results of the study suggest that it is unlikely that the Swedish whitethroats acquired their organochlorine residues south of the Sahara. It is felt that they ingested DDT during their passage through Europe. The same appears true for PCB. In southern Sweden DDT levels are so low that the whitethroats lost much of their DDT during their summer stay. However, concentrations of PCB in the birds remained the same since excretion and ingestion rates were similar.

75-3101. Uchida, M.; Naka, H.; Irie, Y.; Fujita, T.; Nakajima, M. (Dep. Agric. Chem., Kyoto Univ., Kyoto, Japan 606). **Insecticidal and neuroexciting actions of DDT analogs.** *Pestic. Biochem. Physiol.* 4(4): 451-455; 1974. (15 references)

The ability of DDT and its analogs to produce repetitive responses on the nerve cord of *Periplaneta americana* was studied. The minimum concentration of DDT which produced repetitive discharges on nerve cords of the American cockroach at 20°C was 2 x 10^{-6}M. The convulsive activity on *P. americana* and the insecticidal effect on *Callosobruchus chinensis* were also examined. The convulsive activity of DDT analogs was closely related to the neuroexciting ability to produce repetitive discharges. The insecticidal activity of DDT analogs against azuki bean weevils was also related to their repetitive activities on cockroach nerve cords. The same situation was noted with toxicity against houseflies. The intimate connections among these biological effects suggest that symptoms such as convulsions and death caused by DDT analogs are closely related to their neuroexcitatory effect and there is a common mode of action in spite of differences in insect species.

75-3102. Jao, L. T.; Casida, J. E. (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Insect pyrethroid-hydrolyzing esterases.** *Pestic. Biochem. Physiol.* 4(4): 465-472; 1974. (12 references)

This study considers the assay, substrate specificity, and inhibition of insect esterases hydrolyzing (+)-*trans*-and (+)-*cis*-isomers of resmethrin and tetramethrin. Special attention was given to the esterases of the large milkweed bug and NPC as an inhibitor. Esterases in acetone powder preparations of milkweed bugs, cockroaches, houseflies, cabbage loopers, mealworms, and mouse liver hydrolyze the *trans*- and *cis*-isomers of resmethrin and tetramethrin, but they do not hydrolyze *S*-bioallethrin. Homogenate fractions were less suitable than acetone powders for assaying the insect esterases due to inferfering reactions or inhibitors. The *trans*-isomer was cleaved more rapidly than the *cis*-isomer of resmethrin and tetramethrin by the milkweed bug, looper and mouse liver esterases. However, this isomer specificity is less prominent or not present at all with the other esterase sources. In insect preparations the pyrethroid-hydrolyzing esterases are much less active than in mouse liver preparations. 1-Naphthyl *N*-propylcarbamate was a more potent inhibitor than was *S,S,S*-tributyl phosphorotrithioate for the insect esterases. However, the latter was more effective in inhibiting the mouse esterases. Both chemicals are noncompetitive inhibitors in each case. This suggests that they carbamoylate and phosphorylate the detoxifying enzymes. It is suggested that esterase inhibitors acting in the nmolar range may be useful synergists in species where pyrethroid detoxification by esterases limits the insecticidal action.

75-3103. Hammock, B. D.; Gill, S. S.; Hammock, L.; Casida, J. E. (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Metabolic *O*-dealkylation of 1-(4'-ethylphenoxy) - 3,7 - dimethyl -7- methoxy or ethoxy -*trans*-octene, potent juvenoids.** *Pestic. Biochem. Physiol.* 5(1): 12-18; 1975. (14 references)

This study compares the metabolic and photochemical stability of the *p*-ethylphenyl ethers derived from geraniol, 6,7-epoxygeraniol, 7-methoxygeraniol, and 7-ethoxygeraniol. 1-(4'-Ethylphenoxy) - 3,7 - dimethyl-7-methoxy or ethoxy -*trans*-2-octene (the ethylmethoxide and ethylethoxide) are more stable in some and less stable in other biological systems than is the ethylepoxide, 1-(4'-ethylphenoxy) -3,7- dimethyl -6,7- epoxy*trans*-2- octene. The persistence increases in the order of the ethylepoxide, -methoxide and -ethoxide in adult housefly and mealworm pupae, but with adult stable flies the epoxide is of intermediate stability. In living insects and microsomal oxidase systems of houseflies and mouse liver, the alkoxides are metabolized mainly by *O*-dealkylation, at a higher rate for the methoxide than the ethoxide, but benzylic oxidation of the ethyl group also occurs. This is more important in the degradation of the ethyl-epoxide than the ethyl-alkoxides. The photostability on silica gel is slightly better for the ethyl-ethoxide than the -methoxide or -epoxide. Thus the ethyl-ethoxide and related alkaloids provide a way of overcoming the lability of the epoxide substituent in the analogous epoxy comounds. This is advantageous in improving potency and persistence in some cases. However, it may also reduce the spectrum of sensitive insects by providing less satisfactory fit at the hormone receptor site and a substituent easily detoxified by *O*-dealkylating oxidases.

75-3104. Slade, M.; Brooks, G. T.; Hetnarski, H. K.; Wilkinson, C. F. (Dep. Entomol., Cornell Univ., Ithaca, NY 14850). **Inhibition of the enzymatic hydration of the epoxide HEOM in insects.** *Pestic. Biochem. Physiol.* 5(1): 35-46; 1975. (32 references)

This report is mainly concerned with characterization of epoxide hydrases in pupae of the blowfly, *Calliphora erythrocephala*, and larvae of the southern armyworm,*Prodenia eridania*. Results of some studies with adult Madagascar cockroaches, *Gromphadorhina portentosa*, are also included. By using as substrate a cyclodiene insecticide (HEOM) susceptible to enzymatic epoxide ring cleavage, characterization of the hydrases involved in cyclodiene epoxide hydration was achieved. The enzymes, microsomal but different from the oxidases, are inhibited in varying degrees by microsomal oxidase inhibitors as well as by certain epoxides, esterase inhibitors and compounds with juvenilizing ability. For HEOM-hydrase inhibition, group-bulk and electronegative effects are important requirements. The best inhibitor of the system is 1,1,1-trichloro -2,3- epoxypropane. The data of this study, combined with the differences in pH optima in preparations from *Gromphadorhina*, *Calliphora*, and *Prodenia*, suggest that more than one enzyme present in insects is capable of hydrating epoxides, and each has different properties and substrate specificities. Thus, use of the HEOM epoxide hydrase system as a primary model for detecting compounds with potential inhibitory activity towards the metabolism of juvenile hormone has certain limits.

75-3105. Goldstein, J. A.; McKinney, J. D.; Lucier, G. W.; Moore, J. A.; Hickman, P.; Bergman, H. (EPA and NIEHS, Research Triangle Park, NC 27711). **Effects of hexachlorobiphenyl isomers and 2,3,7,8-tetrachlorodibenzofuran (TCDF) on hepatic drug metabolism and porphyrin accumulation.** *Pharmacologist* 16(2): 239; 1974.

The effects in chickens of feeding 400 ppm of 2,4,5,2′,4′,5′ - hexachlorobiphenyl (HCBP) (I), 2,3,6,2′,3′,6′ - HCBP (II), 2,4,6,2′,4′,6′ - HCBP (III), 2,3,4,2′,3′,4′ - HCBP (IV), or 3,4,5,3′,4′,5′ - HCBP (V), were studied. Other chickens were dosed orally with 1 or 5 μg/kg TCDF. All were sacrificed at 3 weeks time. Death occurred between days 8 and 15 in chickens fed V or 5 μg/kg TCDF. Liver weight was increased by the HCBPs in the order of III followed by IV, I and II, but was not increased by TCDF. P450 was increased in decreasing order by IV, I, III, II, TCDF. With ethyl isocyanide as the P-450 ligand, 455/430 ratios were increased by TCDF but not by HCBPs. HCBPs increased *p*-nitrophenol glucuronyl transferase; TCDF did not. Neither the HCBPs nor TCDF affected the testosterone glucuronidation. δ-Aminolevulinic acid synthetase was increased by all HCBPs but not TCDF. Some chicks fed HCBPs became porphyric; this was not found in TCDF. Male C57 BL/6 mice given one oral dose of 0-4000 μg/kg TCDF were not porphyric at 28 days, but mice given 150 μg/kg 2,3,7,8-tetrachlorodibenzodioxin were porphyric. The 4,4′-positions were important for activity and tissue distribution of HCBPs, whereas TCDF, a component of some commercial chlorinated biphenyls, was relatively inactive.

75-3106. Poland, A.; Glover, E. (Univ. Rochester Sch. Med., Rochester, NY 14642). **The induction of aryl hydrocarbon hydroxylase by 2,3,7,8-tetrachlorodibenzo-*p*-dioxin: evidence for a receptor mutation in genetically nonresponsive mice.** *Pharmacologist* 16(2): 240; 1974.

The ability of certain inbred strains of mice to respond to administered aromatic hydrocarbons was studied. Response was noted in the induction of aryl hydrocarbon hydroxylase (AHH) and the formation of cytochrome P_1450. This ability to respond has been shown to segregate in genetic crosses as a simple autosomal trait. The administration of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) induced hepatic AHH activity and cytochrome P_1450 in all inbred strains, both the genetically "responsive" and so-called "nonresponsive" mice. The "responsive" strains were more sensitive to TCDD than the "nonresponsive" strains, as indicated by the dose-response relation for induction of hepatic AHH by TCDD. These studies indicate that the "nonresponsive" mice have the structural and regulatory genes necessary for expression of AHH activity. The defect in "nonresponsive" mice is a regulatory mutation due to an induction receptor with diminished affinity for inducing drugs. This condition results in an almost absolute unresponsiveness to MC and a diminished sensitivity to the more potent inducer, TCDD.

75-3107. Barnes, L.; Karczmar, A. G.; Glisson, S. N. (Dep. Pharmacol., Loyola U. Stritch Sch. Med., Maywood, IL 60153). **Effects of central accumulation of acetylcholine on levels of 3 bioamines in rabbit brain parts.** *Pharmacologist* 16(2): 241; 1974.

The effects of s.c. and i.v. administration of DFP on serotonin (5-HT), norepinephrine (NE) and dopamine (DA) levels were studied. Given s.c. DFP produced marked increases in levels of 5-HT in midbrain, thalamus, hippocampus, and medulla (147, 116, 73, and 41%, resp.). 5-HT of hypothalamus and caudate was little affected. DFP given i.v. induced similar, marked effects. Regardless of the method of administration, DFP increased hippocampal DA and decreased medullary NE. Small changes were noted elsewhere. In animals pretreated with DOPA and a MAOI treatment with DFP markedly increased DA and decreased NE levels in most brain parts. Thus it was concluded that increased levels of acetylcholine (ACh) were capable of changing the levels of 5-HT but not of NE and DA in the absence of the precursor and of MAOI. These differences in the effects of DFP and ACh accumulation on the three bioamines are discussed.

75-3108. Modak, A. T.; Weintraub, S. T.; Stavinoha, W. B. (Univ. Texas Health Sci. Cent., San Antonio, TX 78284). **Dichlorvos and the cholinergic system in the brain.** *Pharmacologist* 16(2): 241; 1974.

Dichlorvos was administered p.o. as a suspension of 50 mg/kg in distilled water. Changes in choline, acetylcholine, and cholinesterase (ChE) were studied in the rats after treatment. Rats were sacrificed 15 min, 3 hr, or 24 hr

after treatment. ChE activity was measured in the liver, plasma, and RBC in addition to the medulla, striatum, hippocampus, and cerebral cortex. Twenty-four hr after treatment the recovery of ChE activity in the four brain areas did not differ significantly from controls (61-70%). A significant difference was seen in the recoveries in plasma (68%) as compared to RBC (75%) and in the liver (100%). Acetylcholine (ACh) levels increased in rat striatum from 55 to 113 nmole/g, in the hippocampus from 26 to 59, in the medulla from 21 to 53. Choline levels decreased slightly in all brain areas studied. ACh levels returned to normal at 24 hr.

75-3109. Anderson, P.; Weber, L. J. (Oregon State Univ., Corvallis, OR 97330). **An approach to multiple toxicity.** *Pharmacologist* 16(2): 252; 1974.

A comparison for parallelism was made with linear regressions representing the lethal response of guppies exposed to ambient concentrations of 6 discrete toxicants. Select combinations of these toxicants, based on this comparison, were categorized and tested for joint toxicity. Four proposed divisions of joint toxicity were considered: concentration, response, supra and infra additive. The toxicants studied were dieldrin, potassium pentachlorophenate, cyanide, and the chlorides of copper, zinc and nickel. Linear regressions with high correlation coefficients were defined for each toxicant. The various mixtures studied demonstrated three of the four categories of multiple toxicity. Mixtures of copper and nickel were of the concentration type. Separate binary mixtures of dieldrin and potassium pentachlorophenate and cyanide and potassium pentachlorophenate were response categorized. Copper and zinc were supra additive. The effect of the quaternary mixture of dieldrin, potassium pentachlorophenate, copper, and nickel was also predicted.

75-3110. Welch, R. M.; Truax, J. F.; Selph, J. L.; Vinegar, R. (Wellcome Res. Lab., Res. Triangle Park, NC 27709). **Effect of organophosphorus anticholinesterases on the metabolism and anti-inflammatory activity of aspirin.** *Pharmacologist* 16(2): 292; 1974.

Male rats were used to investigate the effect of nonlethal doses of several organophosphorus anticholinesterase insecticides on the metabolism and anti-inflammatory activity of aspirin. Aspirin (20 mg/kg, i.v.) was administered to rats which had been treated 24 hr earlier with malathion (200 mg/kg) or chlorthion (200 mg/kg). The plasma half-life of aspirin increased from 3 min to 6 min. Following p.o. administration of aspirin (40 mg/kg) to control rats, the average peak plasma level of aspirin was 0.6 μg/ml at 5 min. This was increased to 3.5 μg/ml in rats pretreated with chlorthion (200 mg/kg, p.o.). The total plasma peak area of aspirin in the chlorthion group was 10 times that of the control group. A dose-response study of chlorthion indicated that as little as 50 mg/kg significantly increased the plasma level of aspirin and that the effect on aspirin metabolism was evident for 5 to 6 days after treatment. The anti-inflammatory activity of aspirin was also increased by chlorthion. The oral ED50 of aspirin against the 3 hr edema volume produced by the intrapleural injection of 100 μg of carrageenin was reduced 3 fold in rats pretreated with 200 mg/kg of chlorthion 24 hr prior to the aspirin.

75-3111. Lefever, G. S.; Green, R. D. (Univ. Illinois Med. Cent., Chicago, IL 60680). **Sensitivity changes in rabbit stomach muscularis after chronic ganglionic blockade and chronic cholinesterase inhibition.** *Pharmacologist* 16(2): 311; 1974.

Strips of stomach muscularis from control, chlorisondamine-pretreated, and disulfoton-pretreated rabbits were used to determine the EC50s, KAs and efficacies (e) of selected agonists. Pretreatment with chlorisondamine made the strips supersensitive to carbachol, but normosensitive to phenylephrine; the e, but not the KA, of carbachol is affected by this treatment. The KB of atropine is unchanged. Pretreatment with disulfoton made the strips subsensitive to phenylephrine, but normosensitive to amidephrine and carbachol; both the e and KA of phenylephrine seem elevated by this pretreatment. The KB of phentolamine was unchanged. The results of this study indicate that the chlorisondamine-induced supersensitivity results from a change beyond the level of the cholinergic receptors. It is suggested that the subsensitivity to phenylephrine after disulfoton pretreatment may result from a qualitative change in the alpha-adrenergic receptors in the stomach muscularis.

75-3112. Pohl, R. J.; Philpot, R. M.; Fouts, J. R. (Natl. Inst. Environ. Health Sci., NIH, Research Triangle Park, NC 27709). **Cytochrome P450 content and mixed-function oxidase activity in microsomes isolated from mouse skin.** *Pharmacologist* 16(2): 322; 1974.

Cytochromes of skin microsomes from male mice were investigated. The major cytochrome appeared to be cytochrome P420. A maximum yield of 0.05 nmol P450/mg microsomal protein was achieved by using a variety of techniques to preserve the cytochromes during homogenization. Spectra of skin were similar to those of microsomes. In skin fragments the benzpyrene hydroxylase (BPOH) activity was low. Microsomal enzyme activity in pmol/min/nmol cytochrome P450 was: liver BPOH = 500, skin BPOH = 250; liver 7-ethoxy-coumarin deethylase (7-EC) = 2000, skin 7-EC = 1500. The topical application of 3-methylcholanthrene at 3 mg/mouse caused no differences from controls in cytochrome P450 difference spectra or in enzyme activity in liver or skin microsomes. The topical application of tetrachlorodibenzodioxin (TCDD) at 3 mg/mouse increased hepatic microsomal cytochrome P450 concentration by 40% after 1 day and 2-fold after 3 days, BPOH 3-fold after 1 day and 5-fold after 3 days, and 7-EC 2-fold after 1 day and 10-fold after 3 days. Treatment with TCDD increased skin microsomal cytoc-

hrome P450 after both 1 and 3 days and BPOH 5-fold after 1 day and 40-fold after 3 days.

75-3113. Smith, C. G.; Hernandez, H. (Univ. Texas Health Sci. Cent., San Antonio, TX 78284). **The effect of DDT on the rat prostate gland grown in tissue culture.** *Pharmacologist* 16(2): 324; 1974.

Tissue culture techniques were used to study the effect of DDT on the prostate gland apart from its effects on liver metabolism of androgens and gonadotropin secretion. Explants of normal rat prostatic tissues were grown in tissue culture. The culture medium contained testosterone (1.0 μM) and varying concentrations of DDT ranging from 5 μg/ml to 50 μg/ml. Tissues were incubated for a period of 1 to 5 days. After incubation the tissues were fixed in formalin, stained with hematoxylin-eosin and examined microscopically. The androgenic stimulation parameters were used to evaluate the DDT effects on the prostate gland. The presence of 5 to 20 μg caused a reduction in the height of the secretory epithelium in much the same way as estrogen has been shown to do.

75-3114. Statham, C. N.; Pepple, S. K.; Lech, J. J. (Med. Coll. Wisconsin, Milwaukee, WI 53233). **Biliary excretion products of 1-naphthyl-*N*-methylcarbamate (carbaryl) and 5,2′-dichloro-4′-nitrosalicylanilide (Bayer 73) in rainbow trout (*Salmo gairdneri*).** *Pharmacologist* 16(2): 327; 1974.

Exposing rainbow trout to ^{14}C-carbaryl and ^{14}C Bayer 73 [sic] (niclosamide) caused bile to water ^{14}C ratios of 1000:1 and 10,000:1, respectively. After 24 hr of exposure, thin layer chromatography of unfractionated bile from the fish showed 3 major radioactive peaks from those exposed to carbaryl and 1 peak from trout exposed to Bayer 73. Fractionation and purification of the radioactive materials in bile from ^{14}C carbaryl treated fish was carried out. Results of this study indicated the presence of unchanged carbaryl, α-naphthyl glucuronide, and a third polar compound. Carbaryl identity was confirmed by TLC and infrared spectroscopy. α-Naphthyl glucuronide was confirmed by TLC, IR spectroscopy, and hydrolysis by β-glucuronidase. It appears that the third component is an hydroxylated naphthol, but this has not been positively identified. Hydrolysis by β-glucuronidase of the purified polar metabolite in bile from trout exposed to Bayer 73 and TLC of the hydrolysis product matched standard Bayer 73. The acid hydrolysis of the β-glucuronidase treated metabolite liberated 5-chlorosalicylic acid. This metabolite was confirmed as Bayer 73 glucuronide by IR spectroscopy.

75-3115. Strzelec, A. (Inst. Uprawy, Nawezenia i Glebosnawstwa, Pulawy, Poland). **Mikrobiologiczny rezklad herbicydow mocznikowych w glebie. [Microbial degradation of urea-derived herbicides in soil.]** *Postepy Nauk Roln.* 22(3): 3-15; 1975. (87 references) (Polish)

The long-lasting effects on biological equilibrium of the soil of the 15 most widely used urea-derived herbicides are reviewed, and molecular diagrams of these compounds are presented. The most important degradation agents are the microorganisms contained in the soil, especially when temperature and humidity conditions are present which favor their development. The most effective of these microorganisms are identified and discussed. Degradation mechanisms of chloroxuron and diuron are described in detail. The principal degradation processes of these herbicides are *N*-demethylation, *N*-demethoxylation, and ring hydroxylation. Methods used for identification of semi-permanent residues of herbicides in soil are discussed briefly. These include colorimetry, chromatography, biological tests, alkaline hydrolysis, and radioisotope labeling.

75-3116. Ferrando, R.; N'Diaye, L.; Gautier, F.; Henry, N. (Lab. Nutr. Aliment., Ecole Nationale Veterinaire, Alfort, France). **Effets, chez la caneton, de regimes renfermant du tourteau d'arachide contenant des aflatoxines en association ou non avec du DDT ou du phenobarbital. Comparaison avec un regime a base de soja. [Effects on duckling of diets containing aflatoxins with or without DDT or phenobarbital. Comparative study of a diet based upon peanut meal.]** *Rec. Med. Vet. Ecole Alfort* 150(7): 601-606; 1974. (10 references) (French)

One-day-old ducklings (*Anas carina moscata*) were fed peanut meal containing 0.25 ppm aflatoxin B1 with or without DDT (50 or 150 ppm) and phenobarbital (100 or 200 ppm) for 3 weeks in an experiment on the effect of DDT and phenobarbital on the toxicity of aflatoxins. The effects were evaluated from the mortality rate, from the gain in weight, and from the feed efficiency. No synergism of 50 ppm DDT with aflatoxin B1 was observed, while phenobarbital added at a rate of 100 ppm had a deleterious effect. However, 150 ppm DDT or 100 ppm phenobarbital significantly reduced the toxic effect of aflatoxin B1. Ducklings fed aflatoxin-contaminated peanut meal had larger livers than those fed soybean meal, whether or not they received DDT. The detoxification of aflatoxins may be due to the inducing effect of DDT and phenobarbital on cytochrome P-450.

75-3117. Singh, M.; Sherma, P. L.; Dhaliwal, H. S. (Dep. Entomol., H. P. Univ., Agr. Complex, Chambaghat-173213, Solan, India). **Toxicity of insecticides to honeybee workers, *Apis cerana indica* F.** *Pesticides* 8(12): 28-29; 1974. (9 references)

Studies were carried out regarding the toxicity to *Apis cerana indica* of some more commonly used insecticides. Of the fifteen insecticides tested, menazon was the least toxic to the foragers. Taking the LC50 value of menazon as unity, endosulfan, DDT, malathion, methyldemeton, carbaryl, phosphamidon, formothion, lindane, parathion, thiometon, methyl parathion, diazinon, dichlorvos, and dimethoate were about 1.1, 5.7, 11.3, 13.7, 16.3, 19.3, 19.4, 20.3, 24.7, 25.8, 26.9, 31.7, 32.0, and 39.0 times as toxic. As the usual recommended dosages for pest control

of menazon and endosulfan are 0.01% and 0.05%, resp., and their LD50 dosages were 0.4826% and 0.4503%, resp., these 2 insecticides may be regarded as nontoxic to bees. DDT and malathion are moderately toxic. The rest of the insecticides tested are highly toxic to bees.

75-3118. Wolfe, H. R.; Armstrong, J. F.; Durham, W. F. (Pestic. Toxic Substances Effects Lab., U.S. EPA, Wenatchee, WA 98801). **Exposure of mosquito control workers to fenthion.** *Mosquito News* 34(3): 263-267; 1974. (4 references)

Potential dermal and respiratory exposure to fenthion was measured during application of 0.06% spray or hand dispersal of the 1% granular formulation. There were 33 different work periods studied over two work seasons, of which 12 were during operation of hand gun power spray equipment, 10 were during back-pack hand pressure sprayer operations, and 11 were during granular dispersal. Results of these studies indicated that calculated potential exposure values for workers during operation of power sprayers or back-pack hand pressure sprays were about the same, and that during granular dispersal by hand, the values were over 3 times as great. In all 3 methods of dispersal, the unprotected body parts subjected to the greatest exposure were the hands, with only slightly less on the forearms. It was concluded at this point that exposure as a result of direct hand and forearm contact with the pesticide formulations or with pesticide contaminated equipment was probably a more important factor in total dermal exposure than was exposure from drift of spray droplets or dust from granules. Calculations indicate that the individual with greatest potential exposure could be subjected only to 0.03% of the toxic dose of fenthion/hr of risk and this rate would only rarely be maintained throughout a full work day. As workers were seen to smoke during application, cigarette contamination studies were made which indicated that contamination values of from 3.2 to 78.5 micrograms of fenthion/cigarette were present. During granular dispersal, this figure rose to between 137.2 and 233.0 micrograms of fenthion/cigarette. In a study of blood cholinesterase levels in 9 workers no significant effects on either the erythrocyte or plasma cholinesterase levels were found, except during periods of particularly intensive and exclusive use of fenthion. In light of even these lowered cholinesterase values during specific times, efforts to keep exposure to a minimum should be maintained. It is recommended that gloves be worn during application. It is especially important to avoid direct hand contact if the hands have cuts or abrasions which allow a more direct route of entry into the blood stream.

75-3119. Schmoranzer, A.; Neumann, G.; Thiemann, K. G.; Strohbach, C. (Regional Veterinary Inst., Frankfurt/Oder, DDR). **Simazin als leistungsmindernder Faktor bei landwirtschaftlichen Nutztieren und Moeglichkeiten der analytischen Erfassung von Triazin-Derivaten.** [**Simazine—a performance-reducing factor in livestock and possibilities for analytical assay of triazine derivatives.**] *Monatsh. Veterinaermed.* 29(13): 491-493; 1974. (9 references) (German)

A case of poisoning by simazine in cattle is reported, and related simazine residue analyses in useful animals are described. Poisoning symptoms were observed in cattle a few days after the application of a combination of simazine, amitrole, and dalapon for weed control due to the ingestion of contaminated grass. One pregnant heifer aborted 4 days after herbicide application. Simazine and its metabolites were detected in the organs of the aborted calf by thin-layer chromatographic method in UV light, using silver nitrate for visualization, at a sensitivity of 0.05 μg/spot. Simazine and the same metabolites were found in the heart, kidney, liver and muscles of chickens experimentally poisoned with 1 g simazine per kg of body weight. The simazine contents found on the second day after poisoning were 0.5 mg/kg in muscles, 0.4 mg/kg in the heart, and 10 mg/kg in the kidney. Except for the kidney, the other organs contained no simazine on the 4th day. The simazine excretion through the kidneys was most intense on the second day. The same metabolites of simazine were detected also in the contaminated grass. Possible relationship between simazine or its metabolite and abortion is suspected. While dalapon and amitrole were not detected in the grass, they may have played a certain role, too.

75-3120. Fairbanks, M. B.; Hoffert, J. R.; Fromm, P. O. (Dep. Physiol., Michigan State Univ., East Lansing, MI 48849). **Short circuiting of the ocular oxygen concentrating mechanism in the teleost *Salmo gairdneri* using carbonic anhydrase inhibitors.** *J. Gen. Physiol.* 64(3): 263-273; 1974. (17 references)

Ocular oxygen concentrations, were examined by countercurrent multiplication in rainbow trout (*Salmo gairdneri*). The oxygen concentration was rapidly suppressed after i.p. injections of the carbonic anhydrase inhibitor, CL-11,366. The onset and completeness of inhibition of the oxygen concentrating mechanism was dose related and apparently dependent on the ionization state of the inhibitor at the time of injection. The rapidity with which the drug acted suggested a short circuiting of the choroidal rete mirabile. The time after injection of inhibitor at which oxygen concentrating ability was lost was compared to the time after injection of inhibitor at which its presence in red blood cells, choroidal rete, psuedobranch, and retinal tissue was first noted. The possible role of carbonic anhydrase from each of these tissues in the process of ocular oxygen concentration is discussed.

75-3121. Roujeau, J.; Nogues, C.; Leclerc, J. P. (Central Service Pathol., Anat. Cytol., Lariboisiere Hosp., Paris, France). **Intoxication par le paraquat. Etude anatomoclinique et experimental.** [**Paraquat poisoning. Pathology and clinical and experimental study.**] *Rev. Fr. Malad. Resp.* 2(1): 65-74; 1974. (13 references) (French)

Clinical, histopathological, and cytopathological

findings in Wistar rats experimentally poisoned with a single 25 mg/kg dose of paraquat i.p. are presented. Depression, reversible anuria, and dyspnea were the first symptoms of poisoning. Cell membranes, altered mitochondria, cytoplasmic fragments, and myelin formations were found in the alveolar lumen on the second day. The alveolar wall showed pronounced alterations, including a tendency to desquamation. The alveolar lesions were advanced on the 8th day. The alveolar walls are covered with fibrin or contain membrane pneumocytes or cells forming a transition between membrane and granular pneumocytes. The basal membrane carrying these cells is dense, and the interstitium contains edematous or fibrinous material. The histogenetic study of the diffuse interstitial fibrosis revealed interstitial edema associated with endothelial and epithelial cell changes, and changes in the basal membranes as the beginning state of the histopathological process. Secondary pneumocytes may be involved in the initial stage of the process.

75-3122. Bankowska, J.; Tyrkiel, E.; Syrowatka, T. (Dep. Toksykol. Sanit., Natl. Dep. Hig., Warsaw, Poland). **Zmiany aktywnosci cholinoesterazy i karboksyloesterazy przy zatruciu szczurow insektycydami enolofosforanowymi IPO-63 i IPO-597. [Changes in cholinesterase and carboxylesterase activity in rat affected by enolophosphate insecticides IPO-63 and IPO-597.]** *Rocz. Panstw. Zakl. Hig.* 26(4): 529-540; 1975. (9 references) (Polish)

The *I*50 of brain AChE and hepatic carboxylesterase were determined. Changes in enzymatic activity were studied after a single administration (1/5, 1/10, and 1/20 LD50, i.p.) of the new Polish insecticides IPO-63, [*O,O*-dimethyl -*O*-1,2,4 dichlorophenyl) -2-bromovinyl phosphate], and IPO-597, (*O,O*-diethyl-*O*- (2,4-dichlorophenyl) -2,2-dibromovinyl phosphate). Detoxifying ability of rat liver was assessed in in vitro investigations of malathion metabolism after an 1/5 LD50 dose of IPO-63 or IPO-597. IPO-597 was a significantly stronger inhibitor of both enzymes than IPO-63. In in vitro tests with *I*50 determinations and in in vivo experiments, the tested preparation had a stronger effect on acetylcholinesterase than on carboxylesterase. Activity of AChE in brain and blood was inhibited for longer periods than hepatic carboxylesterase activity after one administration of the LD50 fractions. When the activity of carboxylesterase was inhibited, the detoxifying ability of the liver fell considerably.

75-3123. Proctor, N. H.; Casida, J. E. (Dep. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Organophosphorus and methyl carbamate insecticide teratogenesis: dimished NAD in chicken embryos.** *Science* 190(4214): 580-582; 1975. (21 references)

Studies with 36 organophosphorus and 12 methyl carbamate compounds established a correlation between reduction in nicotinamide adenine dinucleotide (NAD) levels and severity of teratogenic signs in chicken embryos, a relation supported by reversal of these effects by nicotinamide derivatives. Diminished NAD occurring at organophosphorus and methyl carbamate concentrations as low as 0.6 to 2.0 ppm in the egg constitutes a newly recognized biochemical lesion induced by the two most important classes of insecticide chemicals. (Author abstract by permission. Copyright 1975 by the American Association for the Advancement of Science)

75-3124. Mackowiak, J.; Wisniewski, K. (Dep. Pharmacol., Med. Sch., Bialystok, Poland). **Studies on the effect of fenchlorphos on postirradiation changes of serum protein and nucleic acids content in rat liver.** *Strahlentherapie* 150(1): 97-101; 1975. (20 references)

The effects of fenchlorphos on postirradiation changes in serum protein levels and nucleic acid content were studied in livers of 260 female Wistar rats. Fenchlorphos was administered p.o. in a single radioprotective dose of 250 mg/kg, 3 hr before irradiation. No change in total protein concentration in serum after fenchlorphos administration was found except on the 6th day when a 25% increase in protein content was noted. Irradiation of animals caused a progressive decrease in serum protein concentration beginning on the 6th day. Irradiation of fenchlorphos-treated animals did not exert any effect on serum protein level. Fenchlorphos did not affect albumin, α-globulin or β-globulin levels. Irradiation of rats with 600R induced significant changes in serum proteins. Albumin was distinctly decreased as was the γ-globulin level. Increases in α- and β-globulin were noted. In fenchlorphos-treated groups, irradiation did not affect either the albumin or the β-globulin contents. In fenchlorphos-treated rats, irradiation with 400R did not decrease properdin titer, despite the fact that fenchlorphos alone induced a distinct fall in this protein level in rat serum. Fenchlorphos by itself significantly changed RNA level in rat liver. Irradiation of fenchlorphos-treated animals induced changes of RNA content to a lesser degree. Both fenchlorphos administration and irradiation induced similar changes in the DNA content of rat liver. The results of this study indicate that this compound significantly decreased post-irradiation changes in serum proteins, properdin level and nucleic acid content in rat liver. An important role of these phenomena in the radioprotective action of fenchlorphos is suggested.

75-3125. Denys, A.; Guilbert-Ber, E.; Levy, J. (Inst. Pharmacol., Paris, France). **Caracteres de l'induction enzymatique provoquee par le chlordane. IV. Influence de differentes agressions chez des souris induites par le chlordane. [Character of enzyme inductions by chlordane. IV. Influence of different aggressions in mice induced by chlordane.]** *Therapie* 30(2): 277-288; 1975. (3 references) (French)

The effect of forced immobilization and high and low temperatures on enzyme induction in male Swiss mice by chlordane was studied. The animals were given a single chlordane dose of 7.5 mg/kg i.p. or daily doses of 2.5 mg/kg

i.p. for three consecutive days. Stress (forced immobilization or exposure to 0°C, 10°C, 32°C, or 38°C, for 3 hr each) was applied 24 or 48 hr after or before induction. The induction-modifying effects of the stress factors was evaluated from the response to pentobarbital and zoxazolamine. Exposure to 0°C and forced immobilization after induction intensified the inducing effect of chlordane, while exposure to 32°C did not modify the effect of chlordane. The effect of forced immobilization and exposure to 9°C was on the same order of magnitude as that of chlordane. The supplementary induction by these two types of stress was suppressed by ethionine. The supplementary induction provoked by these stresses is due to mobilization of chlordane from the adipose tissues. Stress before induction did not modify the inducing effect of chlordane.

75-3126. Szutowski, M. M. (Dep. Toxicol. Chem., Med. Acad. Warsaw, Warsaw, Poland). **Effect of carbon tetrachloride on activation and detoxification of organophosphorus insecticides in the rat.** *Toxicol. Appl. Pharmacol.* 33(2): 350-355; 1975. (11 references)

Carbon tetrachloride, 250 or 500 μl/kg, was administered po to rats 24 hr before the insecticide administration. After pretreatment with CCl_4 no signs of fenitrothion poisoning (75% LD50) were observed, but signs of chlorfenvinphos, disulfoton, or dichlorvos poisoning were similar to those observed in the control groups. The liver concentrations of fenitrothion and chlorfenvinphos were increased after pretreatment with CCL_4. The degradation of fenitrothion, chlorfenvinphos, and disulfoton by liver homogenates was diminished after CCl_4 pretreatment. Fenitrothion, parathion, disulfoton, ronnel, bromophos, chlorfenvinphos, and bromfenvinphos cause type I substrate-cytochrome P-450 binding spectra. Difference spectra with dichlorvos, trichlorfon, or polfos were not detectable. These results suggest that most of the organophosphorus insecticides may be metabolized by mixed function oxidase systems and cytochrome P-450. The susceptibility of rats to poisoning by fenitrothion or derivative dialkyl aryl thiophosphates depends upon the activity of the mixed function oxidase system. (Author abstract by permission)

75-3127. Kennedy, G. L., Jr.; Keplinger, M. L.; Fancher, O. E.; Stone, J. D.; Calandra, J. C. (Ind. BIO-TEST Lab., Inc., Northbrook, IL 60062). **Metabolism studies with dinitramine.** *Toxicol. Appl. Pharmacol.* 33(2): 341-349; 1975. (4 references)

A metabolic study with dinitramine in albino rats showed that the compound is rapidly and extensively metabolized. Unaltered dinitramine was detected only in the feces. Chromatographic analysis suggested the occurrence of multiple metabolites in both feces and urine. None of these were identified. Tissue concentrations of dinitramine and/or its tagged metabolites were low, estimated total recoveries from all tissues being 1.5-1.7% calculated as unaltered dinitramine. Treatment of a dairy cow with a single dose of [^{14}C]dinitramine after preconditioning with the unlabeled compound, at levels corresponding to 0.3 ppm in the total diet in each case, gave no detectable concentrations of radioactivity in whole milk and barely detectable amounts in the concentrated lipid fraction. The ^{14}C-activity of all tissues was below the detection limit of 0.36 ppb for 150 mg samples. Only liver samples had counts of 1-3 above background. Exposure of bluegill sunfish to dinitramine revealed no accumulation of residues in fish tissue and the retained residues were rapidly cleared upon termination of exposure. (Author abstract by permission)

75-3128. Jordan, R. L.; Sperling, F.; Klein, H. H.; Borzelleca, J. F. (Dep. Anat. and Pharmacol., Med. Coll. Virginia, Virginia Commonwealth Univ., Richmond, VA 24298). **A study of the potential teratogenic effects of pentachloronitrobenzene in rats.** *Toxicol. Appl. Pharmacol.* 33(2): 222-230; 1975. (12 references)

Pregnant Charles River CD strain albino rats received daily oral doses of 8, 20, 50, or 125 mg pentachloronitrobenzene (PCNB)/kg on Days 6-15 of gestation. Three control groups were also used: a negative control group which received no treatment, a vehicle control group receiving corn oil, and a positive control group which received chlorcyclizine HCl. Treatment with PCNB had no apparent effect on reproductive parameters such as the number and position of implantations, incidence of dead and/or resorbed fetuses, viable litter size, fetal sex ratios, or birth weights. Detailed gross, visceral, and skeletal examinations were performed on fetuses removed from dams on Day 20 of gestation. The number and type of external, soft tissue and skeletal malformations and variations detected in PCNB groups did not differ significantly from those found in negative and vehicle controls. Under the conditions of the present study PCNB, when administered in daily oral doses of up to 125 mg/kg during the period of differentiation and organogenesis, is not embryolethal or teratogenic in the rat. (Author abstract by permission)

75-3129. Tjalve, H. (Dep. Toxicol., Univ. Uppsala, Uppsala, Sweden). **The distribution of labelled aminotriazole in mice.** *Toxicology* 3(1): 49-67; 1975. (32 references)

The distribution of aminotriazole (amitrole) in mice was studied using whole body autoradiography, microautoradiography, impulse counting, and cellular fractionation. Mice of the C57-Bl-strain were used. A high accumulation of radioactivity was noted in tissues with a rapid cell turnover after administration of 14-C-aminotriazole to the mice, indicating that the herbicide participates in some process of cell division. Since the results indicated that most radioactivity was present in the cytoplasm without association with any of the particulate cell fractions, an interference with an early step in nucleic acid synthesis seems possible, perhaps purine synthesis. In the liver, most radioactivity was seen in the perilobular

parts. The radioactivity was rather high in the pancreatic islets at long survival intervals. Only moderate accumulation of radioactivity occurred in the thyroid.

75-3130. Oltersdorf, U.; Miltenberger, R. (Inst. Ernaehrungswiss. I, Univ. Giessen, Giessen, Germany). **Erhoehter Naehrstoffbedarf durch Umweltbelastung? [Increased nutrient demand through environmental pollution?]** *Umschau Wiss. Tech.* 75(16): 508-509; 1975. (4 references) (German)

Data is reviewed on the relationship between nutrition, nutrient demand, and environmental pollution. The enzymatic metabolism and elimination of environmental pollutants, including contaminants in food, requires extra energy, enzymes, vitamins, and certain cofactors such as minerals. An increase in the nutrient demand in general, and in the vitamin and mineral demand in particular, is anticipated as a result of increasing environmental pollution. Nutrition modifies the metabolism and hence the toxicity of pollutants and contaminants in the organism. Malnutrition increases the toxicity in most cases, but it may also result in reduced toxicity. Protein deficient diet reduces the toxicity of aldrin due to reduced metabolism to more toxic products. Protein, vitamin A, and riboflavin deficiency increases the toxic effect of DDT and dieldrin while fat and thiamin deficiency have an inverse effect.

75-3131. Waiwood, K. G.; Johansen, P. H. (Queen's Univ., Dep. Biol., Kingston, Ontario, Canada). **Oxygen consumption and activity of the white sucker (*Catostomus commersoni*), in lethal and nonlethal levels of the organochlorine insecticide, methoxychlor.** *Water Res.* 8(7): 401-406; 1974. (29 references)

The influence of the organochlorine insecticide, methoxychlor, on the pattern of oxygen consumption and locomotor activity of white suckers was investigated. The water was maintained at 15°C and contained different concentrations of methoxychlor in ethanol, ethanol alone, or no added substances. The 96 hr LC50, as determined by a dynamic bioassay, was 0.0345 ppm. A continuous-flow respirometer was used to determine routine oxygen consumption. The activity was recorded in separate experiments by measuring water disturbance using silver wire electrodes. Fish exposed for 24 hr to untreated, ethanol-treated, and 0.01 ppm methoxychlor-treated water had oxygen uptake rates which were relatively constant and near standard levels. At 0.10 ppm methoxychlor, a concentration lethal to all fish within 85 hr, oxygen consumption rates were 2 to 3.5 times as high as those of controls. The activity was also greatly increased. Fish lost their balance along with the coordination between opercular and locomotor movements. Suckers which died of the 0.04 ppm methoxchlor concentration showed oxygen uptake rates and poisoning symptoms similar to 0.10 ppm treated fish. Those fish which survived the 0.04 ppm treatment had rates similar to controls. It is suggested that the increase in ventilation which accompanies this hyperactivity may result in increased uptake of insecticide and thereby explain the irreversible nature of the response.

75-3132. Guthrie, R. K.; Cherry, D. D.; Ferebee, R. N. (Dep. Microbiol., Clemson Univ., Clemson, SC 29631). **The effects of diuron on bacterial populations in aquatic environments.** *Water Resour. Bull.* 10(2): 304-310; 1974. (7 references)

A study was undertaken to more specifically determine the nature of the observed effects following application of diuron to the bacterial populations of 2 aquatic systems. The naturally occurring aerobic, heterotrophic bacterial populations of 2 impounded ecosystems were studied in a tank system. Runoff water from a rural drainage basin entered one reservoir. The second reservoir received water from treated municipal sewage, industrial waste, and heavy recreational use. Each reservoir was treated with diuron to a final concentration of 1.4 ppm. Total bacterial counts and nutritional source types were analyzed. Total counts were seen to increase shortly after the addition of diuron. This was followed, however, by a decrease in total counts to a point below control tank levels. A reduction of diversity was significantly greater in water from the polluted reservoir. However, chromagenic bacteria were significantly reduced in the non-polluted reservoir. Starch utilizers were the most affected group, as determined by isolation of specific nutrient types from the two systems. Bacteria growing on protein or glucose salts were virtually unaffected. It is suggested that these effects and the changes in certain nutrient type populations may upset the food chain by altering the degradative and primary production capacities required of bacterial populations in such aquatic systems.

75-3133. Komissarenko, V. P. (Author address not given). **Pis'mo v redaktsiyu. [Letter to the editor.]** *Klin. Med. (Moscow)* 51: 143-144; 1973. (Russian)

Experimental studies and clinical trials have shown the effectiveness of *o,p'*-DDD, a blocker of adrenocortical hyperfunction, in the control of Cushing's syndrome. Complete or prolonged remissions were achieved by the use of this drug. The use of this drug is limited by its toxicity.

See also **75-2944** **75-2949** **75-2967** **75-2999**

75-3134. Mouillet, L.; Goursaud, J.; Luquet, F. M. (Lab. Dairy Ind., Douai, France). **Dosage par chromatographie en phase gazeuse de residus de pesticides organochlores dans les produits laitiers. Critique de certains methods. Facteurs limitants.** [**Gas-chromatographic analysis of organochlorine pesticide residues in milk products. Critical review of certain methods. Limiting factors.**] *Aliment. Vie* 62(4): 228-235; 1974. (7 references) (French)

Three different gas-chromatographic methods for the determination of organochlorine pesticide residues in milk and milk products are evaluated. Langlois's method and the method prescribed by the U.S. Food and Drug Administration are best suited for the determination of organochlorine pesticide residues, while Stijve's method represents no essential improvement compared with the former methods. The quantity of fat used for the analyses in these three methods is 0.75, 1, and 3 g, respectively. Of a total sample volume of 10 ml, 5 μl are injected into the chromatograph. The sensitivity of the gas chromatograph with electron capture detector amounts to 1 g. Due to its high sensitivity, accuracy, and reproducibility the FDA method is recommended as a reference method also.

75-3135. Fountaine, J. E.; Joshipura, P. B.; Keliher, P. N. (Chem. Dep., Villanova Univ., Villanova, PA 19085). **Determination of pentachlorophenol by ultraviolet ratio spectrophotometry.** *Anal. Chem.* 47(1): 157-159; 1975. (19 references)

A specific system for the analysis of pentachlorophenol (PCP) is presented. This ultraviolet ratio spectrophotometric system was used for analysis of selected samples taken from various points in Haverford Township, Pennsylvania. When the samples are relatively dirty, a preliminary extraction is performed. The sample (250 ml), under acidic conditions, is extracted into 25 ml of chloroform and the PCP is subsequently extracted back into 50 ml of 0.2 *M* NaOH which is then made acidic with HCl (pH 2). Measurement is then made in the normal way with the ultraviolet ratio spectrophotometer. The recovery for PCP is about 98%. The detection limit is about 2 ppb. Samples from Naylor's Run Creek contained up to 12 ppm PCP. Concentration levels were very dependent on climatic conditions.

75-3136. Segebade, C. (Laboratory 6.33 "Application of Radionuclides", Federal Inst. Material Testing, Berlin-Dahlem, Germany). **Sorbentien als Hilfsmittel bei der Neutronenaktivierungsanalyse von Fluessigkeiten.** [**Sorbents as auxiliary materials for the neutron activation analysis of liquids.**] *Anal. Chim. Acta* 67: 216-219; 1973. (4 references) (German)

Sorbents and their use for the neutron activation analysis of elements in metals and in organic substances are described. Sorbents for liquid samples are necessary to obviate separate glass tubes for irradiation and measurement and to eliminate interfering activities of trace elements in glass. Sorbents must have low inherent activity and ensure homogeneous distribution of the substance to be suitable for the purpose of neutron activation analysis. To determine chlorine or bromine in a pesticide, the xylene solution of the sample is adsorbed in mercuric iodide or mercuric bromide. Measurement is done 2.5 sec after irradiation in the same sorbent.

75-3137. Mallet, V. N.; LeBel, C.; Surette, D. P. (Dep. Chem., Moncton Univ., Moncton, New Brunswick, Canada). **Methode de determination du morestan (quinomethionate) dans l'eau d'alimentation de reseau.** [**Analysis of morestan (quinomethionate) in tap water.**] *Analusis* 2(9): 643-646; 1973. (11 references) (French)

A spectrofluorometric method for the determination of morestan (quinomethionate) residues in tap water is presented. After fourfold extraction with hexane, the extract is applied on a silica gel chromatographic plate for the direct measurement of the fluorescence in UV light. Considerable reduction of the fluorescence due to UV light was observed during the first 30 min. When using the wavelengths 364 nm and 418 nm, the limit of detection is between 4 and 6 ng per spot. The relative error of the determination is on the order of magnitude of 2.3%. The fluorescence is linear to 6 μg, while sufficient linearity is observed between 0.006 and 10 μg. The rate of recovery is over 90%.

75-3138. Almeida, J. B.; Piedade, J. R.; Silva, L. P. (Inst. Biol., Sao Paulo, Brazil). **Analise complexometrica de ditiocarbamatos por potenciographia.** [**Complexometric analysis of dithiocarbamates by potentiography.**] *Arq. Inst. Biol. Sao Paulo* 41(2): 63-66; 1974. (5 references) (Portuguese)

Dithiocarbamate fungicides (maneb and thiophanate-methyl) were determined by complexation with titriplex III, followed by potentiography. Organic samples are digested with aqua regia and hydrogen peroxide. The acidified solution is treated with barium chloride, then alkalinized with ammonium hydroxide, and titrated potentiographically using the titriplex solution. Good recoveries were obtained, and the method was easier to use and gave more reproducible results than the previous gravimetric techniques.

75-3139. Kertesz, G. (Dep. Disinfection, Budapest City Public Health and Epidemiol. Stn., Budapest, Hungary). **Cumatetralyl kvantitativ es kvalitativ kimutatasi modszere, annak gyakorlati alkalmazasa.** [**Qualitative and quantitative analysis of coumatetralyl and its practical application.**] *Budapesti Kozegeszsegugy* 3: 89-90; 1974. (Hungarian)

Practical methods for the qualitative and quantitative analysis of coumatetralyl (Racumin, 3-tetralyl-5,4-hydroxycoumarin) in the technical grade product and in the environment are described in connection with a comprehensive rat control campaign with coumatetralyl-containing bait in Budapest. For determination in

technical-grade product or in water, coumatetralyl is extracted with chloroform, cleaned up on an alumina-filled chromatographic column, and measured by UV spectroscopy. Direct determination by thin-layer chromatography is also possible on the basis of the azo dyes formed. An alumina chromatographic plate; a solvent system composed of ethyl acetate, isopropanol, and concentrated ammonia; and solutions of sodium nitrite, sulfanilic acid, and hydrochloric acid as visualizing agents are used for the thin-layer chromatographic determination of coumatetralyl in rat liver after extraction with chloroform. Some 70% of the coumatetralyl were found to accumulate in rat liver. Water samples from the Danube and from creeks contained no coumatetralyl during the rat control campaign, and residues of 0.01 g/l were found in the water of two wells due to the storage of contaminated crates near the wells.

75-3140. Adamich, M.; Towle, A.; Lunan, K. D. (Dep. Marine Biol., California State Univ., San Francisco, CA 94132). **Ficoll density gradient separation of extracellular DDT from *Chlorella*.** *Bull. Environ. Contam. Toxicol.* 12(5): 562-566; 1974. (14 references)

DDT, when used at concentrations exceeding its water solubility, forms heterogeneous particles which are not separable from phytoplankton by normal centrifugation or by filtration. Accurate and complete kinetic studies of DDT-phytoplankton interactions have not, therefore, been possible. It has been observed, however, that extracellular DDT particles are separable from *Chlorella* cells by centrifugation in a discontinuous Ficoll density gradient. The DDT is retained by an 11.5% Ficoll layer, while the *Chlorella* cells sediment on a 30% layer. Using this technique, approximately 99% of extracellular DDT particles can be removed from a suspension of *Chlorella*, and possibly other algae as well. The Ficoll density separation method may also be useful in kinetic studies of other water-insoluble and ecologically important chemicals, such as the herbicide 2,4,5-T and the PCBs.

75-3141. Crist, H. L.; Moseman, R. F.; Noneman, J. W. (Pesticides Toxic Substances Effects Lab., Natl. Environ. Res. Cent., Research Triangle Park, NC 27711). **Rapid determination and confirmation of low levels of hexachlorobenzene in adipose tissues.** *Bull. Environ. Contam. Toxicol.* 14(3): 273-280; 1975. (11 references)

A sensitive, rapid, and reliable procedure is presented for the determination and confirmation of low levels of HCB in lipid material. Chicken fat fortified with HCB was dissolved in hexane and transferred to a Florisil column topped with Na_2SO_4. The HCB was eluted with hexane and evaporated in the Kuderna-Danish apparatus. Heptachlor, aldrin, *p,p'*-DDE, and *o,p'*-DDT were also partially eluted from the Florisil column, while the various isomers of hexachlorocyclohexane (BHC), heptachlor epoxide, dieldrin, endrin, *p,p'*-DDT, and *p,p'*-DDD (TDE) were retained. Recovery of HCB from fat samples fortified at 4-100 ng ranged from 86-107%. Different amounts of HCB standard were derivatized to BITB and chromatographed to establish the linearity of the reaction. The reproducibility and linearity of the derivative indicated that it would be a valuable adjunct to the quantitation of HCB; in particular, this procedure could be extremely useful in instances where similarly eluting compounds prevent the accurate measurement of the HCB peak. The derivatization also allows the analyst to confirm the presence of HCB in adipose tissue in concentrations as low as 5 ppb. Pyridine appeared to promote additional reaction of HCB to the disubstituted product. The monosubstituted derivative (IPB) gave a linear response at shorter reaction times (10 min) and the derivatives were in equilibrium depending on the reaction time at a constant pyridine level. Interferences could be circumvented in many instances without additional separation by the selection and preparation of the appropriate derivative of HCB.

75-3142. Ekstrom, G.; Johansson, S. (Natl. Swedish Inst. Plant Protection, Solna, Sweden). **Determination of glyphosate (*N*-phosphonomethyl glycine) using an amino acid analyzer.** *Bull. Environ. Contam. Toxicol.* 14(3): 295-296; 1975. (3 references)

Standard solutions were prepared from herbicidal formulations of Roundup, which contains 360 g/l of the active ingredient, glyphosate. The solutions were injected into an automatic amino acid analyzer fitted with a 690 × 9 mm glass column packed to a height of 550 mm with spherical cation exchange resin. Citrate buffer (pH 3.28) was used as the eluting solvent. The light absorption of a colored complex formed from the glyphosate and ninhydrin reagent was measured in a 2.2 mm cuvette at 570 nm after ion exchange chromatography. By this procedure, the glyphosate concentrations could be determined from the optical densities of peak areas. The minimum detectable amount of glyphosate was 1 nm, and the smallest amount that could be reproducibly quantitated was 20 nm or 3.4 μg.

75-3143. Nangniot, P. (Author address not given). **La polarographie appliquee au dosage de petites quantites de fongicides ou d'insecticides en depots ou en residus sur plantes cultivees. IX. Le dosage polarographique du dipentamethylene thiurame monosulfure, du dipentamethylene thiurame disulfure et dipentamethylene thiurame tetrasulfure. [Polarography applied to the determination of small quantities of fungicides or insecticides in deposits or residues on cultivated plants. IX. Polarographic determination of dipentamethylene thiuram monosulfide, dipentamethylene thiuram disulfide, and dipentamethylene thiuram tetrasulfide.]** *Bull. Rech. Agron. Gembloux* 6(3-4): 490-501; 1971. (6 references) (French)

The polarographic behavior and determination of dipentamethylene thiuram monosulfide, dipentamethylene thiuram disulfide, and dipentamethylene thiuram tetrasulfide were studied and compared to that of

TMTD. The polarographic behavior of these compounds differed only in minor details. Dipentamethylene thiuram monosulfide, however, differed significantly from TMTD via its reduced reduction rate at the mercury electrode and its resistance to alkaline hydrolysis. Compared with dipentamethylene thiuram monosulfide, dipentamethylene thiuram disulfide showed a higher rate of adsorption at the dropping mercury electrode surface, and rapid hydrolysis in strongly alkalin medium. Compared to these two compounds, dipentamethylene thiuram tetrasulfide is characterized by increased rate of hydrolysis in alkaline medium and reduced solubility in acetone. For polarographic determination, these substances are extracted from plant material by means of methanol or acetone. Filtration is usually unnecessary. Oscillopolarography with imposed voltage is preferred to conventional polarography because of its higher sensitivity. Dipentamethylene thiuram monosulfide is determined in 0.2 *N* hydrochloric acid with a sensitivity of 0.3 μg/ml, while dipentamethylene thiuram disulfide can be determined in acetic acid-sodium acetate buffer at a sensitivity of 0.16 μg/ml. The limit of sensitivity is 0.02 μg/ml for dipentamethylene thiuram tetrasulfide in water-acetone.

75-3144. Kroeller, E.; Krull, L. (Bundesgesundheitsamt, Max v. Pettenkofer Inst., Berlin-Dahlem, Germany). **Eine Moeglichkeit zur Restmengenbestimmung von Indolyl-3-essig-, propion- und Buttersaeure in Kartoffeln. [A method for residue analysis of 3-indolyl acetic, propioni, and butyric acids in potatoes.]** *Dtsch. Lebensm.-Rundsch.* 71(8): 294-296; 1975. (11 references) (German)

vegetable foodstuffs in order to detect residues of 3-indolyl-acetic, -propionic, and -butyric acids used as growth regulators. After several preliminary tests, a method using thin-layer chromatography has been developed which has an approximate sensitivity of 0.05 ppm of the test substance. After extracting the shredded potatoes and cleaning up the extract by shaking, the concentrate containing the test substance is developed chromatograpically on a silica gel plate. Pilot solutions of the three 3-indolyl fatty acids in parallel applications serve to identify and evaluate the test sample.

75-3145. Blume, R. R.; Oehler, D. D.; Younger, R. L. (Vet. Toxicol. Entomol. Res. Lab., Agric. Res. Serv., College Station, TX 77840). ***Ontophagus gazella*: a nontarget arthropod for the evaluation of bovine feces containing methoprene.** *Environ. Entomol.* 3(6): 947-949; 1974. (4 references)

In the laboratory, methoprene (Zoecon ZR-515) (isopropyl 11-methoxy -3,7,11- trimethyl -2,4-dodecadienoate) pre-mixed in bovine manure at 100, 10, 5, and 1 ppm inhibited hatch of eggs of the dung beetle (*Ontophagus gazella* F.) by 100, 56, 33.3, and 8.7%, respectively. Manure from a steer treated daily with methoprene at a rate of 1 mg/kg body weight inhibited egg hatch up to 32.6%. Surviving larvae, pupae, and adult beetles were normal, and no reduction was apparent in fecundity of surviving adult beetles due to exposure to methoprene while they were in developmental stages. (Author abstract by permission)

75-3146. Nesemann, E.; Seehofer, F. (BAT Cigarettenfabriken GmbH, Forsch, Entwickl. Abt., Hamburg, Germany). **Methoden zur quantitativen Bestimmung von Bioziden in Tabak und Tabakerzeugnissen. V. Mitteilung: Eine Schnellmethode zur Bestimmung des Harnstoff-Herbizides Metobromuron (Patoran). [Methods for quantitative determination of biocides in tobacco and tobacco products. Part 5. A rapid method for determining the urea herbicide metobromuron (Patoran).]** *Beitr. Tabakforsch.* 7(5): 245-250; 1974. (5 references) (German)

When an attempt was made to apply the method for determination of metobromuron in foods to tobacco analysis, only very small amounts of metobromuron and less than 0.1 ppm of 4-bromoaniline were found. In an improved method, tobacco was distilled under hydrolyzing conditions and the 4-bromoaniline released was bound as the hydrochloride. Following liberation of the base, the anilines are transferred into hexane and analyzed by gas chromatography. A microcoulometric detector is used to detect halogen, and a Coulson conductivity detector for nitrogen. The digestion process used permits release of bound 4-bromoaniline from plant components, but does not permit distinction between 4-metobromuron and 4-bromoaniline in treated plants. A recovery rate of 92% was obtained with a reproducibility of 3%, and the time required for analysis was substantially shortened. The metobromuron residues in cigarettes produced from tobacco grown in soil treated with Patoran at 4 kg/ha before planting averaged 5.8 ppm.

75-3147. Ganguly, S. K.; Bhattacharya, K. P.; Kar, P. (Calcutta, India). **Detection of parathion and sumithion in biological materials.** *Forensic Sci.* 5(2): 129; 1975.

The colorimetric method of Averell and Norris is unable to detect parathion and sumithion (fenitrothion) in cases of double poisoning, because the resulting azo compounds in each case are purple with UV absorption maxima at 550 nm. Converting these compounds to their phenolates and examining the derivatives by UV absorption spectrophotometry, while offering another method of analysis, also fails since both derivatives have absorption maxima at 400 nm. A method is proposed which uses thin layer chromatography for separation and detection of the compounds after preliminary extraction from biological materials by suitable solvent directly, or by steam distillation, followed by solvent extraction. A method is also presented for separating the purple colored compounds produced by the Averell-Norris method, by TLC.

75-3148. Kneffel, Z.; Desi, I.; Sarosi, E. (National Inst. Public Health, Budapest, Hungary). **Vizek kisfoku**

peszticid szennyezettsegenek kimutatasa elattani mukodes valtozasan alapulo modszerrel. [Detection of trace quantities of pesticides in waters by a method based on changes of physiological functions.] *Hidrol. Kozlony* 5: 224-226; 1975. (Hungarian)

A new high-sensitivity biological test for the detection of pesticides in water is described and compared with the known guppy and *Daphnia magna* tests. Glochidia of *Anodonta cygnea* were used for the test in which the frequency of closures of the shells in pesticide-containing water was used as a criterion for the presence of pesticide in the water. The glochidia were kept in water containing 0.1, 0.01, 0.001, or 0.0001 mg of malathion, aprocarb (propoxur), or bromophos per liter for 5 days, and microscopic examinations were performed daily at constant water temperature and after adaptation to light. The motion frequency of the shells showed statistically significant changes even at 0.001 mg/l. The no-effect concentration of aprocarb and bromophos was determined to be 0.0004 mg/l, and that of malathion was found to be 0.00005 mg/l by regression analysis. The comparison with the known tests shows low sensitivity of the guppy test, higher sensitivity of the *Daphnia magna* test, and highest sensitivity of the *Anodonta cygnea* test. The new method is recommended for use in addition to the known tests.

75-3149. Chin, W. T.; Duane, W. C.; Szalkowski, M. B.; Stallard, D. E. (Diamond Shamrock Corp., T. R. Evans Res. Cent., Painesville, OH 44077). **Gas chromatographic determination of thiofanox residues in soil, plants, and water.** *J. Agric. Food Chem.* 23(5): 963-966; 1975. (5 references)

Thiofanox (P), 3,3-dimethyl -1-(methylthio)-2-butanone *O*-[(methylamino) carbonyl]oxime, undergoes two-step oxidation in soil, plants, and animals to its sulfoxide (P_1), 3,3-dimethyl -1-(methylsulfinyl) -2-butanone *O*-[(methylamino) -carbonyl]oxime, and sulfone (P_2), 3,3-dimethyl -1-(methylsulfonyl)-2- butanone *O*-[(methylamino) -carbonyl]oxime. Procedures are presented for determining the total carbamate residues of the thiofanox (Pt) and some individual metabolites in soil, plants, and water. (Author abstract reprinted by permission of the American Chemical Society)

75-3150. Que Hee, S. S.; Sutherland, R. G.* (Dep. Chem. Chem. Eng., Univ. Saskatchewan, Saskatoon, Saskatchewan, Canada). **A specific gas-liquid chromatographic method for analysis of some amine salts of 2,4-dichlorophenoxyacetic acid.** *J. Agric. Food Chem.* 23(5): 1007-1008; 1975. (4 references)

The methyl-, dimethyl-, *n*-butyl-, and *n*-dodecylamine salts of 2,4-dichlorophenoxyacetic acid (2,4-D) were analyzed by conversion to the corresponding amide and subsequent gas-liquid chromatographic analysis. As the amide function retains the identity of the original acid and amine, the original amine salt can be identified. (Author abstract reprinted by permission of the American Chemical Society)

75-3151. Dekker, W. H.; Selling, H. A. (Chem. Lab. RVO-TNO, Rijswijk, The Netherlands). **Gas-liquid chromatographic analysis of the herbicide dinoterb (2,4-dinitro-6-*tert*-butylphenol) in soil.** *J. Agric. Food Chem.* 23(5): 1013; 1975. (4 references)

Dinoterb (2,4-dinitro-*tert*-butylphenol), recovered from soil, was analyzed by gas chromatography after methylation with diazomethane. A minimum detection limit of 1 μg/kg of soil could be reached. Therefore, it was essential to remove the excess diazomethane before analysis. (Author abstract reprinted by permission of the American Chemical Society)

75-3152. McDermott, W. H. (Res. and Dev. Dep., Union Carbide Corp, S. Charleston, WV 25303). **Carbaryl insecticide: extraction from dust and powder formulations.** *J. Assoc. Off. Anal. Chem.* 58(1): 28-32; 1975. (5 references)

Some 10% and lower guarantee carbaryl dusts cannot be quantitatively extracted by shaking with chloroform as specified in the official first action infrared method for carbaryl formulations, 6.206-6.208. A repeatability extraction study has been made, using a different extraction technique, and the mixed solvents are suitable for all solid carbaryl formulations. It is recommended that a collaborative study be conducted on the new solvent system and extraction technique. (Author abstract by permission)

75-3153. Crombie, L.; Pattenden, G.; Simmonds, D. J. (Dep. Chemistry, The University, Nottingham, NG7 2RD, England). **Carbon-13 nuclear magnetic resonance spectra of the natural pyrethrins and related compounds.** *J. Chem. Soc. Perkin Trans.* 4(5): 1500-1502; 1975. (6 references)

The pyrethrins are insecticidal esters found in *Chrysanthemum cinerariaefolium*. Several useful synthetic analogues have been prepared due to the desirable insecticidal properties of natural pyrethrins. The ^{13}C spectra of the natural pyrethrins, synthetic allethrin, and the chrysanthemic acid and alcohol molecules from which the esters are constituted are presented in this paper. Resonances were assigned by chemical shift comparisons, single frequency off-resonance proton decoupling, and specific ^{13}C-^{1}H decoupling with proton resonances.

75-3154. Ogama, A.; Wakaizumi, N.; Nagasawa, K. (Fac. Pharm. Sci., Kitasato Univ., Tokyo, Japan). **[A clean-up method for the detection of *N*-methylcarbamate insecticides in foods by thin-layer chromatography.]** *Eisei Kagaku (J. Hyg. Chem.)* 21(5): 294-299; 1975. (10 references) (Japanese)

A clean-up method suitable for the determination of methylcarbamate insecticides in brown rice, green tea, cabbage, and spinach by thin-layer chromatography was developed. The method consists of the treatment of the specimen extracts with a coagulating solution containing ammonium chloride and phosphoric acid (4 times the amount recommended in the AOAC method) followed by

washing with an alkaline solution. Washing with sodium benzoate solution is effective for removing caffeine from extracts of green tea, and washing with an acidic solution is necessary for removing contaminants in extracts of cabbage and spinach. By this method, 0.1 ppm carbaryl added to untreated specimen was finally recovered in a 100 μl ethanolic solution, with a minimum detection volume of 4-5 μl. The detection of 2-isopropoxyphenyl- 3,4-dimethylphenyl- and 2-*sec*-butylphenyl-*N*-methylcarbamates from fortified specimens (1 ppm each) was proven successful when 3-7 μl of the final solution was subjected to thin-layer chromatography.

75-3155. Jeltes, R. (TNO Res. Inst. Environ. Hygiene, Delft, The Netherlands). **Fingerprinting techniques as aids in the analysis of composite chemical pollutants in the environment.** *J. Chromatogr. Sci.* 12(10): 599-605; 1974. (30 references)

Chemical fingerprinting techniques are particularly well suited for the identification, correlation, and source recognition of a variety of composite environmental pollutants, including many kinds of effluents and emissions. Besides their usefulness in identifying oil pollutants, these techniques can be used in principle for other mixtures in water, soil, and air environments. Examples of this technique in the determination of mineral oils, fatty oils, polychlorinated biphenyls, solvent mixtures, and effluents in water and soil, and of lower hydrocarbons, polynuclear aromatics, solvent mixtures, and emissions in air are given.

75-3156. Mukherjee, G.; Mukherjee, A. K.; Chakraborti, J.; Roy, B. R. (Central Food Laboratory, Calcutta, India). **A comparative study on the efficiency of different adsorbent columns for the clean-up of pesticide residue extracts.** *J. Food Sci. Technol. (Mysore)* 11(4): 175-176; 1974. (15 references)

The efficiency of the columns of alumina, silica gel, silica gel-celite, magnesium trisilate, magnesium hydroxide, and charcoal were compared. Alumina, whether inactivated or activated, at temperatures of 100 and 550°C, though slowing the complete removal of fat and a partial removal of pigments, gave 100% recovery of chlorinated pesticides. Recovery was poor in the case of malathion. Alumina could not retain the natural color of wheat flour and the color of butter yellow, wereas it removed the color of extracts obtained from fruits, vegetables, and other cereals. For fatty foods such as milk, cheese, and butter, the eluate contained small amounts of fat but this was not sufficient to interfere in the TLC estimation. Silica gel and silica gel-celite columns were not satisfactory due to the presence of both fat and pigments in the eluate. Silica gel activated at 100°C for 3 hr retained a major portion of both chlorinated and organophosphorus pesticides. However, the incorporation of celite with silica gel as a 1:1 mixture retrieved 70-85% of lindane and DDT in the eluate, but was not effective for malathion. Magnesium trisilicate activated at 100°C for 3 hr retained pigments but the elution was too slow and complete pesticides recovery was not achieved. Unautoclaved magnesium hydroxide gave poor recoveries of DDT and malathion. However, the column containing activated charcoal showed excellent adsorption of pigments and fat from the residue extracts. It retained not only the natural colors of cereal and vegetables, but also the artificial colors like butter yellow. Thus the activated charcoal can be successfully used for cleanup of cereals, vegetables, and fatty foods by the column procedure. The solvent partitioning step prior to column cleanup can be omitted.

75-3157. Kist, A. A.; Khatomov, Ch.; Krygenkova, N. A.; Orestova, S. S.; Tuchkova, R. Ya.; Juk, L. I.; Flitsian, E. S.; Gofen, G. I.; Tchekhomova, L. A.; Danilova, E. A.; Abdullayev, Ya. S.; Batygina, N. A. (Atomic Energy Commissariat USSR, Moscow, USSR). **Analyse par activation de microquantites d'elements dans les materiaux biologiques. [Activation analysis of microquantities of elements in biological materials.]** *J. Radioanal. Chem.* 19(2): 277-287; 1974. (8 references) (French)

Examples are given for the applications of activation analysis for the detection and determination of microquantities of elements in biological matter. Direct activation analysis is possible for the determination of arsenic- and mercury-containing pesticide residues, while the determination of organochlorine pesticide residues via the chlorine ion requries highly selective extraction due to the more or less high concentration of chlorine in biological matter. Gamma spectrometry is unsuitable due to its low sensitivity. The sensitivity of activation analysis of organochlorine pesticide residues is generally in the order of magnitude of 0.01 μg.

75-3158. Ososkova, T. A.; Rozhkova, N. K. (Inst. Chem. Vegetable Substances, Acad. Sci. Ukrainian SSR, USSR). **Opredelenie butilkaptaksa v semenakh khlopchatnika i pochve metodom tonkosloynoy khromatografii. (Determination of butylcaptax in cotton seeds and soil by thin-layer chromatography.)** *Khim. Sel. Khoz.* 12(9): 618-619; 1974. (Russian)

A thin-layer chromatographic method for the determination of butylcaptax residues in cotton seeds and in soil is described. Following threefold extraction with ethanol and reextraction with *n*-hexane, the concentrated sample is applied on an alumin a layer, using a 1:1 ratio of *n*-hexane and benzene as a solvent system. Visualization is done by means of bromophenol reagent (bromophenol blue in acetone and silver nitrate in a 3:1 water-acetone mixture). After spraying, the chromatographic plate is dried at 100-110°C, and the dried plate is treated with 40% acetic acid solution. Butylcaptax appears in the form of blue spots against a yellow background. The *Rf* value is between 0.55 and 0.65. The sensitivity of the method is 1 mg/kg for cotton seeds, and 0.8-1 mg/kg in soil.

75-3159. Kellner, R. (Inst. Anal. Chem. Microchem., Technical Univ., Vienna, Austria). **Ueber die Einsatzmoeglichkeit der Kombination Duennschichtchromatographie-Infrarotspektrospopie zur quantitativen Gemischanalyse von Dialkyldithiocarbamidaten. [The possibility of employing the combination thin-layer chromatography-infrared spectroscopy for the quantitative analysis of dialkyldithiocarbamate mixtures.]** *Microchim. Acta* 2(2): 253-256; 1975. (8 references) (German)

The use of a combination of thin-layer chromatography and IR spectroscopy for the quantitative analysis of dialkyldithiocarbamate mixtures was studied on Cu(TMDTC)2 and Co(TMDTC)3 as model substances. Thin-layer chromatographic determination was done on silica gel H with a 65:30:5 mixture of hexane, chloroform and diethylamine as a solvent system. The substance was eluted after visualization, dissolved in trichloromethane, and filled into a glass cylinder which incorporated a powdered potassium bromide-containing small tube for the retention of the substance to be analyzed, and to filter out suspended silica gel particles. The top layer of the potassium bromide was directly pressed in to a tablet for measurement in a grid type spectrophotometer. In contrast to separation of the thin-layer carrier material by centrifugation, there were no interfering absorption bands in the IR spectrum of the substance in the small tube method. However, the variation coefficient, amounting to 13.2% for 5 μg Co(TMDTC)3. must be taken into account in quantitative investigations. The small tube method is suitable for the IR spectroscopic qualitative and semiquantitative analysis of dialkyldithiocarbamidate mixtures even in the μg range.

75-3160. Gay, L.; Cerny, M. (Chem. Lab. of the City of Zurich, Pesticides Dep., Zurich, Switzerland). **Sweep Co-Destillation als Reinigungsverfahren zur routinemaessigen Bestimmung der Organochlorpestizidrueckstaende in fetthaltigen Lebensmitteln. [Sweep codistillation as a cleanup method for routine determination of organochlorine pesticide residues in fat-containing foods.]** *Mitt. Geb. Lebensmittelunters. Hyg.* 66: 225-237; 1975. (8 references) (German)

Clean-up of organochlorine pesticide residue extracts from fats, oils, and fat-containing foods by sweep codistillation for routine determination is described. The pesticide residue extract is slowly injected into a silanized column with silanized packing in nitrogen carrier at 250°C, after which hexane is injected for 20-30 min. for the elution and codistillation of the residues adsorbed on the column packing. The hexane containing the pesticide residue is condensed by cooling, and subjected to further cleanup on a florisil column. The lower limit of detection was found to be between 5 and 10 ppb for lindane, α-BHC, β-BHC, aldrin, dieldrin, heptachlor epoxide, *p,p'*-DDE, and *p,p'*-DDT. The recovery rates varied between 84 and 107%.

75-3161. Seifert, J.; Davidek, J.; Egertova, J. (Dep. Food Chem., Suchbatarova 1905. Prague, Czechoslovakia). **Indirect polarographic determination of folpet.** *Pestic. Sci.* 6(2): 173-179; 1975. (14 references)

The possible use of the indirect polarographic determination of folpet after its conversion to phthalimide was investigated. Using this method it was possible to determine both folpet and phthalimide in commercial preparations. It was necessary to separate folpet on a column of silica gel. The content of folpet was 79.1% and of phthalimide, 6.4%. Using a spectrophotometric method, 81.0% of the folpet was found. The determination of surface residues of folpet on strawberries and cotton seeds using a solution of L-cysteine as reaction and extraction solvent proved useful. Anthocyanins contained in strawberry must be removed by washing the ethylacetate extract with water. Recovery from samples of strawberies was 98-105%, and for cotton seeds, 103-112%. This study thus showed that the method of indirect polarography may be applied for the analysis of pure and commercial preparations of folpet and for the determination of residues in plant samples. The linearity in the broad concentration region, the stability of the reaction product, and the milder experimental conditions represent advantages of this method over that involving resorcinol.

75-3162. Piechocka, J. (Panstwowy Zaklad Higieny, Warsaw, Poland). **Oznaczanie karbarylu w mleku. [Determination of carbaryl residues in milk.]** *Rocz. Panstw. Zakl. Hig.* 25(1): 41-46; 1974. (12 references) (Polish)

A detailed description is given of a colorimetric method which uses *p*-nitrobenzene-diazonium fluoroborate in order to determine residues of carbaryl in milk. The method is adapted to industrial control of dairy products. Measurements conducted at a wavelength of 475 nanometers established that the smallest trace of carbaryl that can be detected by this method is 0.025 mg/kg. The amount of carbaryl that can be recovered from milk by the process described depends on the density of solution and is 72% - 80% for a concentration of 0.025 mg/kg and 80%-97% for a concentration of 0.1 mg/kg.

75-3163. Piechocka, J. (Dep. Food Anal., Natl. Inst, Hyg., Warsaw, Poland). **Oznaczanie propoksuru w ziemniakach. [Determination of propoxur in potatoes.]** *Rocz. Panstw. Zakl. Hig.* 26(4): 503-508; 1975. (Polish)

Thin-layer chromatography and colorimetry were used to determine propoxur in potatoes. The potatoes were extracted with acetone and chloroform. Photometric determination at 490 nm was used to detect the absorption of the colored compound with 4-aminoantipyrine after cleanup of the extract and hydrolysis of propoxur. Extracts were similarly obtained for determination by thin-layer chromatography. Benzene/ethyl/acetate (9+) was used as the mobile phase. Using pig liver as an enzyme source and β-naphthyl acetate with fast blue as substrate, propoxur spots were identified. Detectability of propoxur by thin-layer chromatography was 0.005 mg/kg and by the colorimetric method 0.05 mg/kg.

75-3164. Okumura, T. (Shionogi Res. Lab., Shionogi & Co. Ltd., Osaka, Japan). [**Sintered thin-layer chromatography. XII. Thin-layer chromatography on porous metal oxide sintered plates.**] *Yakugaku Zasshi (J. Pharm. Soc. Jpn.)* 95(3): 304-311; 1975. (20 references) (Japanese)

Porous sintered metal oxide plates have shown promise for use in thin-layer chromatographic separation of organic compounds such as glycosides, pesticides, sterols, and sapotenins. The plates were prepared using one part of adsorbent (magnesium silicate, magnesium oxide, titanium dioxide, or zinc oxide), and 3-4 parts of powdered soda-lime glass was suspended in an organic solvent; the slurry was spread on a soda-lime glass plate and air dried. Heating the thin layer in an electric furnace for several minutes at 400-700°C yielded an adsorbent-fused glass layer. The porous metal oxide adsorbents were stable to high temperature, as evidenced by the fact that no sintering of the adsorbents was detected by scanning electron microscopy or x-ray diffraction. Differential thermal analysis and differential scanning colorimetry failed to show any thermal mass change, except for a change in crystal form in the case of titanium dioxide. A titania sintered plate gave Rf values of 44 for EPN, 58 for γ-BHC, and 83 for dieldrin, developed with cyclohexane at a rate of 17 min/10 cm. Separation of these three pesticides on anatase and rutile forms of titania sintered plates was similar.

75-3165. Juenger, E.; Najer-Rapie, B.; Schmid, E. R. (Anal. Inst., Vienna Univ., Austria). **Enzymatischer Nachweis Carbamate-Pesticiden auf impraegenierten Cellulose-Platten.** [**Enzymatic detection of carbamate pesticides on impregnated cellulose plates.**] *Z. Lebensm.-Unters.-Forsch.* 157(5): 281-285; 1975. (14 references) (German)

The optimal conditions for the thin-layer chromatographic-enzymatic detection of carbamate pesticides (aldicarb, carbyne, propoxur, benomyl, carbaryl, chlorpropham, diallate, amdrocarb, methomyl, phenmedipham, and triallate) were studied on impregnated cellulose plates with a dry thickness of 250 microns. Impregnation with ethylene glcol was found to be better than with triethylene glycol or β,β′-oxydipropionitrile. Pig liver esterase and indophenylacetate as chromogenic substrates were found best for the determination of enzyme inhibition. The optimal conditions were determined to be room temperature, pH 9, an inhibition time of 30-40 min, and an enzyme dilution of 1:20. The limit of detectability was in the ng range for the different carbamates, with 0.1 ng for carbaryl.

75-3166. Neururer, H. (Bundesanst. Pflanzenschutz, Vienna, Austria). **Bioteste in der Herbologie.** [**Bioassays in weed research.**] *Z. Pflanzenkr. Pflanzensch.* 82(5): 316-328; 1975. (10 references) (German)

Bioassays are the only suitable method for recording biological activity of herbicides. Chemical and physical procedures are only useful for identifying substances. Laboratory and greenhouse bioassays are useful in weed research for testing substances and detecting herbicides in water, soil, and biological material. A modification of the cress root test has been proven useful for testing large numbers of herbicides in filtrates, soil extracts, and solutions. Detection of a large number of herbicides found in the normal range of herbicidal dosages in the soil may be done with root studies. Optimism for the improvement of current bioassays is stimulated by differentiation tests using microscopic changes in root tip tissue as a criterion for detection in combination with root growth tests. For a qualitative assessment of soil herbicides, a selection of test plants can be used. Determination of herbicide persistence and mobility in soil can be made over a 4 wk period through testing and comparison of vegetative yieldes of sensitive test plants and control plants.

75-3167. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **Vapam.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 717. (1 references)

Vapam (sodium methyldithiocarbamate) is nonvolatile and therefore not amenable to gas chromatographic analysis. However, Vapam can decompose to yield methyl isothiocyanate (MIT), carbon disulfide, hydrogen sulfide, methylamine, and other breakdown products, and the residues of these compounds can be determined by gas chromatography. For determining the decomposition products of Vapam in soil, a 25 in. o.d. aluminum column packed with Fluoropak 80 coated with 4% silicone oil 550 and 1% Carbowax 400 is used. A 6 ft column is recommended for the detection of MIT and a 12 ft column is recommended for methylamine and carbon disulfide. The columns are maintained at 70°C with a helium gas phase of 30 psi; flow rates are 95 and 75 cc/min for the 6 and 12 ft columns, respectively. Methylamine and MIT are determined using a hydrogen flame detector and carbon disulfide is determined using a thermal conductivity detector. Retention times for methylamine, MIT, and carbon disulfide are 1.0, 3.5, and 0.7 min, respectively, and the results are linear over the range 1-15 μg/0.5 μl of liquid sample.

75-3168. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **Nemagon.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 714-716. (3 references)

Two methods are recommended for the determination of Nemagon (dibromochloropropane) residues in soil. With the first, the sample is shaken with acetone and the supernatant liquid is analyzed on a Barber-Colman Model 10 gas chromatograph equipped with an electron capture detector and a 2 ft X 6 mm i.d. U-shaped glass column

packed with 100-120 mesh Porapak Q; the column temperature is 200°C. Under these conditions, the retention time of Nemagon is 17 min, and the recovery rate of 1 ppm Nemagon from soil was 84%. With the second method, the sample is shaken with distilled water and redistilled hexane. The supernatant hexane is analyzed on an Aerograph Hi-Fy Model A-600-B gas chromatograph equipped with an electron capture detector and a 5 ft X 1/8 in. stainless steel column packed with 5% DC-11 on 60-80 mesh Chromosorb W (not acid washed); the column temperature is 105°C. The retention time Nemagon under these conditions is less than 1 min and recoveries of about 100% were reported from various soil samples spiked with 11.4 ng of pesticide.

75-3169. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **Ethylene dibromide.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 711-712. (3 references)

Ethylene dibromide formulations can be analyzed by gas chromatography using polyethylene glycol 6000 as the stationary phase, helium (70 ml/min) as the carrier gas, and 1,2-dichloropropane as the internal standard. Gas chromatography was also utilized to determine the sorption of ethylene dibromide, ethylene dichloride, and carbon tetrachloride by 51 cereal products. The retention time for ethylene dibromide on a 6 ft column packed with 10% SE-30 and 60-80 mesh Diatoport S was 3.05 min relative to *n*-pentane. The uptake of all ethylene compounds increased with increasing moisture content in the wheat and with a decrease in particle size by grinding. Ethylene dibromide, ethylene chlorohydrin, and other volatile fumigant residues in flour and whole wheat were determined using a 2 m X 1/4 in. o.d. column packed with 15% Ucon oil LB-550-X on 60-80 mesh Chromosorb W at 85°C. Steam distillation and chloroform extraction followed by determination on a column of polyethylene glycol 6000 yielded 83.5% recoveries of ethylene dibromide.

75-3170. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **Vegadex.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 704-707. (1 reference)

For the residue analysis of vegadex (sulfallate), the crop sample is extracted with acetone, and a portion of the filtered extract is partitioned into hexane. Analysis is done on a Jarrell-Ash Model 700 Gas Chromatograph equipped with a no. 26-755 electron capture detector containing 100 μCi of tritium. The 4 ft X 1/4 in. o.d. stainless steel column is packed with 5% ethyl acetate fractionated Dow Corning high-vacuum silicone grease on 90-100 mesh Anadrom ABS. The injector temperature is 240°C, the column temperature is 175°C, and the detector temperature is 200°C; the nitrogen carrier gas flow rate is 150 ml/min. The procedure is applicable to beets, turnips, lettuce, cabbage, broccoli, and Chinese cabbage, and is sufficiently sensitive to estimate 0.01 ppm of dacthal (chlorthal-methyl) and vegadex and 0.05 ppm of Zytron (DMPA). Recoveries for all three herbicides range from 88 to 101% and simultaneous determination of a mixture of all three compounds is feasible.

75-3171. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **Tordon (picloram).** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 700-701. (10 references)

For the determination of Tordon (picloram) residues in tissues and blood, the samples are extracted with sodium bicarbonate-methanol, filtered, concentrated, acidified, and extracted with diethyl ether. The samples are adsorbed on alumina and the Tordon is eluted with sodium bicarbonate. Oxidation with potassium permanganate for additional cleanup may be necessary. The Tordon is methylated and analyzed by gas chromatography. Milk samples are extracted with diethyl ether, cleaned up on alumina, and methylated prior to gas chromatograpy. Tordon can also be decarboxylated to 4-amino-3,5,6-trichloropyridine and analyzed at 160°C using a gas chromatographic column packed with 3.5% OV-17 plus 4.5% QF-1 on 80-100 mesh Chromosorb W-HP; ^{3}Ni electron capture detection is employed. The minimum residue level detectable by this method is 5 ppb, and the results are linear between 10 and 1000 ppb. Tordon residues in soil, water, and forage samples are determined by on-column decarboxylation and determination using a 6 ft X 5 mm i.d. spiral glass column packed with Vycor chips, 3% SE-30 on 60-80 mesh Chromosorb W, and 10% DC-200 on 60-80 mesh Gas Chrom Q. This method has also been used for the analysis of TBA, amiben, and dicamba.

75-3172. Devine, J. E. (Syracuse Univ. Res. Corp., Syracuse, NY). **Stam (propanil).** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 692-696. (1 reference)

For the determination of propanil and its metabolite 3,4,3',4'-tetrachloroazobenzene (TCAB) in soil, the sample is extracted with acetone benzene and washed with sodium hydroxide. The benzene layer is washed with hydrochloric acid, then with sodium sulfate, and is evaporated in a Kuderna-Danish evaporator. Analysis is done by gas-liquid chromatography using a ^{63}Ni detector and a 6 ft X 1/4 in. U-shaped Pyrex column packed with 5% SE-30 on 60-80 mesh chromosorb W. Rice and rice straw samples are extracted in a similar fashion, after which the residues are eluted on an alumina column with benzene (for the TCAB) and acetone-benzene (for the propanil). Determi-

nation is done by gas chromatography under the same conditions as above. For the determination of 'bound' 3,4-dichloroaniline (DCA) in rice and rice straw, the residue is hydrolyzed by refluxing with sodium hydroxide solution and benzene. The solution is then subjected to steam distillation, and the aqueous distillate is extracted with benzene. Analysis is done by gas chromatography using a microcoulometric detector and a 4 ft X 1/4 in. o.d. Pyrex column packed with 10% DC-200 on 60-80 mesh Chromosorb W-AW-DMCS.

75-3173. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **Silvex (2,4,5-TP).** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 688-690. (3 references)

A rapid screening method for the analysis of silvex in raw water is recommended. The sample is saturated with sodium sulfate and shaken with sulfuric acid-water and diethyl ether. The ether layer is evaporated to dryness, dissolved in boron trifluoride-methanol solution, and held in a boiling water bath for 2 min. After cooling, the solution is shaken with hexane and sodium sulfate solution. This solution is injected into a gas chromatograph equipped with an electron capture detector. A standard curve is prepared using a methylated silvex standard. This screening procedure should also be applicable to other phenylalkanoic acid herbicides, since it determines both silvex and its esters. Silvex and its propylene glycol butyl ether ester can also be determined in soil samples by electron capture gas chromatography using a 6 ft X 4 mm glass column packed with 10% DC-200 on 80-100 mesh Anakrom ABS at 195°C. For residue determinations in fish, the sample is blended with methanol and filtered, the filtrate is diluted with water and acidified, and silvex and its ester are extracted with petroleum ether. After separation of silvex from the ether by partitioning with a sodium bicarbonate solution, the ester is cleaned up on Florisil. Analysis is done on a 4 ft X 0.25 in. column packed with 10% DC-200.

75-3174. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **Prometryne.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 680-683. (1 reference)

Milk samples containing prometryne, atrazine, and/or simazine are shaken with methyl alcohol, sodium oxalate, ethyl ether, and petroleum ether. The solvent layer is recovered and the milk is extracted two more times with the mixed ethers. The combined extracts are washed with water, passed through anhydrous sodium sulfate, and evaporated, and the remaining fat is taken up in petroleum ether. The petroleum ether is then extracted three times with acetonitrile, which is washed with petroleum ether and evaporated to dryness. The residue is dissolved in benzene and transferred to an alumina column, which is eluted with *p*-hexane. The triazines are recovered with a mixture of benzene and hexane. The solution is evaporated, dissolved in ethyl ether, evaporated once again, and dissolved in benzene. Determination is done on a Dohrmann microcoulometric gas chromatograph equipped with an aluminum column packed with 5% Carbowax 20 M on Anakrom ABS. Average recoveries for simazine, atrazine, and prometryne are 67%, 96%, and 96%, respectively. The high specificity of the method is achieved by the removal of other pesticides during column cleanup and the use of microcoulometric detection.

75-3175. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **Prometone.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 679. (2 references)

Residues of prometone, prometryne, and propazine in soils can be analyzed by gas chromatography using flame ionization or electron affinity detection. A 100 mg sample of soil is shaken with 150 ml acetone for 30 min, after which the mixture is filtered and concentrated to 2 ml using a Kuderna-Danish apparatus. Five μl of the concentrated acetone extract is injected into a chromatograph with 2.5 or 3.0 m columns packed with 2.5% Versamid 900 on 60-80 mesh Diatoport S, programmed at 170-205°C per min, using a helium flow rate of 115 ml/min. Recoveries were 88-100%, 102-105%, and 92-95% for prometone, prometryne, and propazine, respectively, and the limit of detection is about 0.1-0.2 ppm in each case.

75-3176. Buxton, R. W.; Ja. W. Y.; McKay, J. C. (Stauffer Chem. Co., Western Res. Cent., Richmond, CA). **Prefar.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 672-678.

Prefar (bensulide) in formulation samples is determined by gas chromatography with Imidan as internal standard. Liquid emulsifiable concentrates are first diluted with carbon disulfide, while granular formulations and dusts are extracted with carbon disulfide-chloroform-acetone. The recommended instrument is a Hewlett-Packard Model 402 equipped with a hydrogen flame ionization detector and a 1.5 ft X 0.25 in. o.d. Pyrex glass column packed with 3% OV-1 on 60-80 mesh Gas Chrom Q. Off-column injection without an elevated inlet temperature is suggested. Prefar residues in macerated crop samples and water are extracted with benzene, while soil samples are shaken with methanol-water, then with benzene and aqueous sodium chloride solution. When required, cleanup may be by Nuchar shakeout, solvent partition, or liquid column chromatography. Analysis is by gas chromatography on a Varian-Aerograph Model 600D equipped with an alkali flame ionization detector and a 300

X 2 mm i.d. Pyrex glass column packed with 10% DC-200 silicone oil on 100-120 mesh Gas Chrom Q. The limit of detection is 0.05 ppm, recoveries generally range from 90 to 105%, and none of the registered phosphorus-containing pesticides have the same retention time as Prefar or its oxygen analog.

75-3177. Patchett, G. G.; Shelman, D. L.; Smith, W. J. (Stauffer Chem. Co., Western Res. Cent., Richmond, CA). **Ordram.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 668-670.

Liquid emulsifiable concentrates of Ordram (molinate) are diluted with carbon disulfide and granular formulations are extracted with carbon disulfide-chloroform-acetone prior to analysis by gas chromatography with Ro-Neet (cycloate) as an internal standard. The recommended instrument is a Varian-Aerograph Model 1520 equipped with a flame ionization detector and a 6 ft X 0.25 in. o.d. Pyrex glass column packed with 3% OV-17 on 60-80 mesh Gas Chrom Q. Methyl silicone stationary phases are undesirable for this analysis because they do not separate *S*-ethylhexylthiocarbamate, an impurity in Ordram, from Ordram. A gas chromatograph equipped with a thermal conductivity detector can also be used. For the residue analysis of Ordram, rice grain and rice plant samples are steam distilled and analyzed by gas chromatography at 185°C. The retention time for Ordram is 2.8 min.

75-3178. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **Monuron, diuron, and neburon.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 664-666. (6 references)

Fenuron, monuron, monolinuron, neburon, diuron, and linuron residues in soil extracts are subjected to thermal decomposition catalyzed by tetraethylammonium hydroxide and analyzed by gas chromatography on a 1.7 m X 4.5 mm column of Versamid 900 on Chromosorb G-AW-DMCS with temperature programming and flame ionization detection. Monuron and diuron residues in soils, fruits, and vegetables can also be determined by programmed temperature gas chromatography on a column containing 20% Apiezon L grease with flame ionization detection. For the determination of diuron in water, the sample is extracted twice with dichloromethane, dried and concentrated, partitioned between saturated sodium chloride and isooctane, and analyzed by electron capture gas chromatography on a stainless steel column of 5% E-301. Grapes containing monuron residues are extracted with acetone, after which the residue is evaporated and shaken with benzene to produce 2,6-dibromo-4-chloroaniline. Similar procedures are used to determine diuron residues in raspberries and linuron residues in carrots.

75-3179. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **Linuron.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 659-661. (1 reference)

Linuron and seven other substituted urea herbicides (benzomarc, chlorbromuron, diuron, fluometuron, metobromuron, methoxymarc, and neburon) are directly determined in soil by electron capture gas chromatography at 150°C. Air-dried soil samples are shaken with methanol, the methanol removed, and the residue dissolved in redistilled 2,2,4-trimethylpentane. This solution is shaken with anhydrous sodium sulfate prior to chromatography on a Varian Aerograph 1520 equipped with a 1.5 m X 3.5 mm o.d. stainless steel column packed with 5% E-301 (methyl silicone) on 60-80 mesh Gas Chrom Q. The injector temperature is 265°C and detector temperature is 200°C. It is essential that glass be excluded from the system. The retention time of linuron under these conditions is a little less than 1 min. Residues of linuron were determined at 0.1-1.0 ppm in three soils of different organic matter contents with a mean recovery of 88%, the minimum detectable amount being 0.05 ppm. Linuron, diuron, neburon, and methoxymarc are not resolved from each other under the recommended conditions, so that it would be necessary to confirm the identities of unknown residues by alternative means.

75-3180. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **IPC (propham).** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 657-658. (3 references)

For the residue analysis of IPC (propham), the propham is hydrolyzed to produce aniline, and the aniline is concentrated in the form of its salt by acidification with concentrated hydrochloric acid, extraction of the neutral and acidic impurities with ether, and evaporation of the aqueous layer under reduced pressure. The residue is reacted with 4-chloro-α,α,α-trifluoro-3,5-dinitrotoluene and shaken with sodium bicarbonate solution and hexane for 1 hr. The upper hexane layer is then injected into an Aerograph Model 600B gas chromatograph equipped with either a tritium electron capture detector or a hydrogen flame ionization detector. The 10 ft X 1/8 in. o.d. stainless steel column is packed with either 3% SE-30 silicone gum or 3% FFAP (free fatty acid phase) on HMDS-treated 60-80 mesh Chromosorb G. Temperature should range from 150-205°C at gas flow rates of 30 ml/min. IPC can be detected in amounts as low as 50 pg using this method.

75-3181. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ., Res. Corp., Syracuse, NY). **Ioxynil.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J.

Sherma, Eds., Academic Press, New York, 1972, p. 654-656. (2 references)

An emission spectrometric detector monitoring the 2062 A iodine line can be used to analyze residues of ioxynil and two possible metabolites, 3-iodo-4-hydroxybenzonitrile (MII) and 3,5-diiodo-4-hydroxybenzoic acid (IBA) in wheat, oats, and soil. Soil samples are blended with acetone and orthophosphoric acid, evaporated to near dryness, and extracted three times with chloroform. The extract is dried and the possible residues of ioxynil, MII, and IBA are esterified with diazomethane. Samples of oats and wheat are blended with hydrochloric acid, benzene, and sodium sulfate, after which they are extracted with benzene. The benzene extracts are extracted with sodium bicarbonate, acidified with hydrochloric acid, and extracted with chloroform. The residues are dried and esterified as above. Analysis is on a gas chromatograph equipped with a microwave-powered emission spectrometric detector and a 2 ft X 4 mm i.d. borosilicate glass column packed with 5% SE-30 on 80-100 mesh acid-washed Chromosorb W. The retention times for MII, ioxynil, and IBA are about 2, 6, and 10 min, and recovery levels of the three compounds (0.1-2.0 ppm) in various samples ranged from 69 to 108%.

75-3182. Ja, W. Y.; Patchett, G. G.; Smith, W. J. (Stauffer Chem. Co., Western Res. Cent., Richmond, CA). **Eptam.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 644-651. (1 reference)

Liquid emulsifiable formulations of Eptam (EPTC) are diluted with carbon disulfide solvent and granular products are extracted with carbon disulfide-chloroform-acetone prior to dilution. Eptam is then determined by flame ionization gas chromatography with Sutan (butylate) as an internal standard. The Pyrex glass chromatographic column is 6 ft X 0.25 in. o.d. and packed with 3% OV-1 on 80-100 mesh Gas Chrom Q. Thermal conductivity detector may also be used, but acetonitrile should be used as the extracting solvent in this case. Thiocarbamate herbicides other than Sutan may also be used as internal standards. For the residue analysis of Eptam, crop and soil samples are extracted by steam distillation, partitioned into a small volume of isooctane, and analyzed by gas chromatography with the Melpar flame photometric detector in the sulfur mode. The 184 cm X 2 mm i.d. Pyrex glass column is packed with 10% OV-17 on 80-100 mesh Gas Chrom Q. Recoveries are typically 80-100%.

75-3183. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **DNBP (Dinoseb) (also DNOSBP).** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 639-642. (2 references)

The alkanolamine salts of DNBP in a macerated crop sample are converted to DNBP with dilute sulfuric acid, after which the herbicide is extracted with benzene or, in the case of samples containing large amounts of oil, with acetonitrile. The extracted DNBP is cleaned up by Florisil column chromatography, methylated, and eluted on an alumina column with ethyl ether. The residue is evaporated to dryness, dissolved in hexane, and injected into an Aerograph Hi-Fy Model 600B gas chromatograph equipped with an electron capture detector. The 5 ft × 1/8 in. spiral Pyrex glass column is packed with 10% w/v QF-1 on 60-80 mesh Chromosorb W-AW. The column is conditioned at 225°C for 3 days and the temperature is then lowered to 180°C and allowed to stabilize overnight. The nitrogen carrier gas flow rate is 30 ml/min. The retention time of methyl DNBP is about 10 min. The results are linear over a range of 50-3000 pg DNBP, and herbicide concentrations as low as 0.01 ppm can be detected reliably. The overall average recovery of DNBP residues (0.01-0.5) on almonds, cherries, peaches, and apricots was 90%.

75-3184. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **2,4-Dichlorophenoxyacetic acid.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 630-635. (3 references)

Formulations of the chlorophenoxy acids and dicamba are extracted with ethyl ether, evaporated to dryness, and esterified with *N,O*-bis(trimethylsilyl) acetamide. Analysis is on a Perkin-Elmer Model 811 gas chromatograph equipped with a thermal conductivity detector and a 6 ft × 1 mm i.d. column packed with 5% DC-200 silicone oil on 80-100 mesh Chromosorb W HP. The column temperature is 190°C. All chlorophenoxy acids gave single, sharp, symmetrical peaks under these conditions, but a better separation of dicamba, MCPA, and MCPP could be obtained with a temperature-programmed analysis if all were found in the same formulation. Gas chromatographic methods have also been applied to the determination of 2,4-D residues in fatty and nonfatty foods, water, milk, human blood, and urine. Samples of canned apricots and grapes are extracted with chloroform and the herbicide is absorbed on alumina, acidified, extracted, and methylated prior to analysis on a 5% SE-30 column. 2,4-D and 2,4,5-TP can also be converted to the 2-butoxyethyl esters and analyzed by electron capture gas chromatography on a column of 5% QF-1 at 200°C.

75-3185. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **DEF.** *Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 627-629. (3 references)

For the determination of DEF residues in soil, the sample should be extracted with chloroform and the sol-

vent evaporated. The residue is then dissolved in benzene prior to gas chromatographic analysis. The recommended chromatographic instrument is an F & M Model 700 equipped with a potassium chloride thermionic flame ionization detector or equivalent. The 15 in. × 3 mm i.d. borosilicate glass column is packed with 5% DC-200 silicone oil coated on 70-80 mesh DMCS-treated Chromosorb G. The column temperature is 200°C, the injection port temperature is 240°C, the detector temperature is 230°C, and the nitrogen carrier gas flow rate is 65 ml/min. DEF is identified by its retention time which, under the conditions recommended, is 3.8 min. Recovery from eight silt loam and clay soils at the 0.1 ppm level averaged 111%, and the standard curve is linear up to about 0.8 ppm DEF. Similar procedures have been applied to the analysis of DEF residues in animals tissues, cottonseed, cottonseed oil, and milk.

75-3186. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **Dalapon.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI., Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 621-626. (4 references)

For the analysis of dalapon residues in water, the pH of the sample is adjusted to 1 with hydrochloric acid and the sample is extracted several times with diethyl ether. The ether is, in turn, extracted with sodium bicarbonate solution, after separation of the phases, the dalapon is extracted under acid conditions. The residue is methylated and analyzed on a gas chromatograph equipped with an electron capture detector and a 5 ft × 1/8 in. stainless steel column packed with 60-80 mesh Chromsorb P treated with hexamethyldisilane; the solid phase is coated with 10% FFAP and the column temperature is 140°C. Average recoveries were 91-100% from distilled and canal water samples containing 0.5-1000 ppb dalapon. For the analysis of dalapon in fresh crops, dry crops, oily crops, and body fluids, the sample is blended with an aqueous buffer system containing phosphotungstic acid, and a portion of the extract is saturated with sodium chloride and extracted with diethyl ether. Dalapon is determined in the ether extracts by electron capture gas chromatography. Recoveries from 22 diverse substrates fortified with 0.05-2.0 ppm dalapon averaged 90%.

75-3187. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **Dacthal.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 616-620. (1 reference)

For the formulation analysis of dacthal and hexachlorobenzene (HCB), a constituent of the commercial product, the granular product is ground, extracted with benzene in a Soxhlet extractor, evaporated, dissolved in acetone, separated on a gas chromatographic column, and detected by a flame ionization detector. The 6 ft × 1/8 in. stainless steel column is packed with 10% UC-98 on 80-100 mesh-silanized Diatoport S. Aldrin has the same retention time as dacthal at the recommended column temperature (200°C); these compounds can be separated at a column temperature of 170°C. Residues of dacthal in vegetable and agronomic crops are extracted with methylene chloride, isopropanol, and/or acetonitrile, and cleaned up by selective partitioning and absorption chromatography on an alumina column. Analysis is by chloride microcoulometric gas chromatography on a glass column containing 20% Hi-Vac silicone grease on acid-washed Chromosorb at 250°C. The sensitivity of the procedure is 0.002 ppm, and it is applicable to cabbage, onions, tomatoes, sweet potatoes, strawberries, cottonseed, and soybeans.

75-3188. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **CIPC.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 612-615. (4 references)

For the determination of controlled release capsules containing 50-75% CIPC (chlorpropham), the samples are crushed and extracted with benzene and injected into a thermal conductivity gas chromatograph with a 4 ft × 0.25 in. aluminum tube packed with 15% SE-30 on 60-80 mesh Chromosorb W. Columns of 2 m or longer and temperatures exceeding 230°C will cause degradation of the CIPC. For the analysis of CIPC in technical products, emulsifiable concentrates, and granular formulations, a thermal conductivity gas chromatograph with a 2 m × 4 mm stainless steel tube packed with 15% Silicone FS 1265 and 1% Emulsogen W-32 on 45-60 mesh Chromosorb W is used. The recommended method for determination of CIPC residues in fruit and vegetable crops involves extraction with acetone and partitioning in hexane. The herbicide is directly hydrolyzed and brominated to yielded the brominated aniline derivative, which is detected by electron capture gas chromatography with a sensitivity of about 0.02 ppm. In this case, the 6 ft × 9 mm o.d. glass column is packed with 5% ethyl acetate-fractionated Dow Corning high vacuum silicone grease on 80-100 mesh acid-washed Chromosorb W.

75-3189. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **Bromoxynil.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 605-610. (2 references)

A method is recommended for the determination of bromoxynil residues in grain and straw from wheat, barley, and oats, and in whole flax seed. The limit of detection for the method is 0.05 ppm or lower. The procedure for determining residues in grain or straw begins with a hot alkaline hydrolysis which frees bound herbicide, if any,

and hydrolyzes the octanyl ester to the free phenol form of bromoxynil. The following cleanup step involves liquid-liquid partition, methylation with diazomethane, chromatography on a Florisil column, and gas chromatography. The quantitative evaluation is accomplished by the gas chromatogaphic step. The 6 ft × 1/4 in. o.d. glass chromatographic column is packed with 10.5 gm of 16% w/w SE-30 on 60-80 mesh Gas Chrom Z; the column temperature is 180-185°C, isothermal and the nitrogen carrier gas flow is 110-120 ml/min. The sample preparation method coupled with the use of a microcoulometer detection system avoids potential interferences from a variety of other pesticides cleared on small grain crops. To distinguish bromoxynil from 2,4-D, the gas chromtographic response of a portion of extract methylated with boron trifluoride-methanol is compared with that of another portion of the same extract methylated with diazomethane.

75-3190. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **Bromacil.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 603-604. (4 references)

Various gas chromatographic methods have been employed for the residue analysis of bromacil. The recommended procedure uses a microcoulometric titrating system with temperature programming and a column of 20% SE-30 plus 0.2% Epon 1001. Bromacil has been determined in various agricultural crops and soils by chromatography on a 13 in. column of 5% NPGA at 195°C with electron capture detection; sensitivity ranged from 0.01 ppm for soil residues to 0.1 ppm for crop residues. Recoveries of 85-89% were obtained from plant material, soil, and water using a 5 ft column of 3% QF-1 and 2% DC-200 at 200°C with electron capture detection. In the latter case, the retention time of bromacil was about 6 min with a nitrogen flow rate of 30 ml/min. Bromacil was also estimated in soil (0.04-0.4 ppm) by blending the sample with ethyl acetate, isolating the herbicide by evaporative codistillation, and analyzing by electron-capture gas chromatography on a 2-ft 10% Ucon Polar column of 200°C with a nitrogen flow rate of 80 ml/min. A similar method was used to estimate terbacil in alfalfa (0.5-1.0 ppm), in this case using a 3 ft column at a temperature of 170°C.

75-3191. Zweig, G.; Sherma, J. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY). **Atrazine.** *IN: Analytical methods for pesticides and plant growth regulators. Vol. VI, Gas chromatographic analysis.* G. Zweig and J. Sherma, Eds., Academic Press, New York, 1972, p. 600-602. (2 references)

Residues of atrazine and simazine in corn, soil, and water are quantitatively determined by gas chromatography using a rubidium sulfate-modified alkali-flame detector with a movable electrode. The corn and oil samples are extracted with chloroform in a Goldfisch fat extraction apparatus, and the internal standard prometone is added to the crude extract prior to evaporation of the solvent. The extracts are then redissolved in acetone. Water samples are extracted with methylene chloride. Purification of the extracts is unnecessary because of the sensitivity and selectivity of the alkali-flame detector for nitrogen. Analysis is done on a Barber-Colman Model 5320-100 chromatograph modified with differential flow controllers and equipped with a 1.9 m × 3 i.d. Pyrex column packed with 10% w/w Reoplex 400 on 80-100 mesh Gas Chrom Z; the column temperature is 200°C. Minimum detectable limits of triazine are 50 ppb in corn, 20 ppb in soil, and 1.0 ppm in water. Recoveries of atrazine from corn (1-100 ppm), soil (1-100 ppm), and water (0.1-10 ppm) averaged 97, 93, and 98%, respectively, while those for simazine averaged 100, 100, and 102%, respectively.

See also **75-2957** **75-2962** **75-2963** **75-3082** **75-3083** **75-3119**

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